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S. C. STILLWAGON, Editor

B. BRITTAIN WILSON, General Manager
EDWARD V. OSBERG, Associate Editor
M. L. WULFORST, Circulation Manager
S. R. HAGUE, Assistant Editor

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Dispersion of Pigments in Aqueous Medium

II. Induced Dilatancy and Its Relation to Dispersion . . . .

F. K. Daniel[1]

THE first part of this paper discussed wetting, dispersing, and protecting agents and the various known methods of evaluating dispersing agents. In this second part a new dispersing agent will be compared with other representative agents of this type, and a new method of determining the degree of dispersion based on dilatancy will be presented.

Sedimentation Tests on Four Different Dispersing Agents

The new agent, "Hornkem," designated as agent A, is a colloidal, sulphonated derivative of vegetable origin, processed and purified by a special process. The structure of its molecule is unknown. Agent B is identical with agent A except that it has not been purified. Agent C is a polymerized organic salt of a sulphonic acid of alkyl-aryl type; while agent D is a dispersing agent of the glucoside type.

The dispersing power of these four agents for zinc oxide was determined by the sedimentation volume method: 1.42 grams of zinc oxide (Red Seal, Anaconda), having a displacement volume of 0.25 c.c., and 9.75 c.c. of solution of the different dispersing agents in varying concentrations were shaken vigorously for 30 seconds in glass stoppered graduates with 1/10 c.c. divisions. After standing undisturbed, the volume of sediment at different periods was observed and recorded in Table 1.

With no dispersing agent present, the volume of sediment was found to be large. After one day's settling the upper layer was perfectly clear, and thereafter the volume of sediment formed, slowly decreased until it had reached a constant value after the fourth day. With agent A there was very little sediment at the end of 24 hours, and the upper layer was extremely cloudy. As the suspended zinc oxide particles slowly settled, the volume of sediment increased, but did not become constant until after complete sedimentation.

It appears from Table 1 that there exists an optimum concentration of agent A at which the dispersing effect is at a maximum; above as well as below this optimum value, dispersion is not so pronounced. Agent B shows this same behavior; with concentrations of 24% and 12% of agent B a clear top layer was obtained after 24 hours.

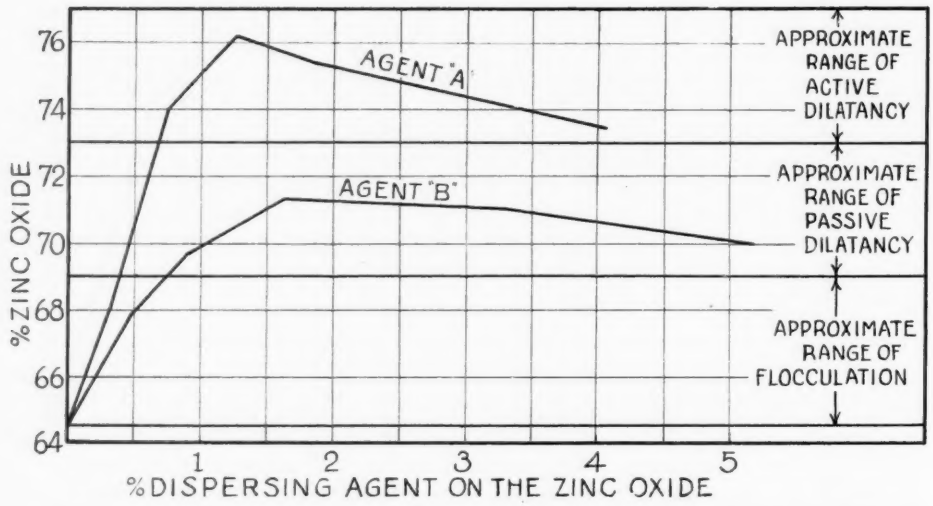
TABLE 1. VOLUME OF SEDIMENTATION

Concentration of Dispersing Agent		Number of Days of Settling: 1	2	3	4	5	6	7
		Cu. Cm. of Sediment after Settling						
No Agent.		8.60	8.50	8.50	8.3	8.3	...	...
Agent A..	11.00%	1.10	1.29	1.36	1.41	1.46	1.49	1.49
	2.80%	1.18	1.31	1.38	1.39	1.39	1.40	1.40
	1.10%	1.18	1.31	1.35	1.38	1.38	1.40	1.40
	0.56%	.90	1.10	1.18	1.19	1.20	1.20	1.20
	0.28%	.91	1.12	1.20	1.20	1.20	1.20	**1.21**
	0.07%	1.05	1.22	1.29	1.30	1.30	1.30	1.30
Agent B..	24.00%	3.56	2.10	1.79	1.70	1.69	1.65	1.65
	12.00%	2.00	1.7	1.69	1.69	1.69	1.69	1.69
	3.00%	1.65	1.65	1.65	1.66	1.65	1.65	1.63
	1.20%	1.22	1.4	1.41	1.42	1.41	1.42	1.41
	0.60%	2.00	2.01	2.01	2.01	2.01	...	...
	0.30%	2.22	2.23	2.23	2.22	2.22	...	...
	0.08%	2.60	2.55	2.55	2.55	2.55	...	...
Agent C..	2.90%	2.25	2.25	2.25	2.25	...	...	...
Agent D..	2.80%	3.90	3.90	3.90	...	...	...	...

At all other concentrations, however, cloudiness prevailed for several days. With 0.08% dispersing agent some flocculates were seen adhering to the glass wall. The smallest volume of sedimentation after seven days was 1.41 c.c. for agent B as compared to 1.20 c.c. for A. After the first day the difference was even greater; 1.22 c.c. for B and 0.90 c.c. for A.

In the case of agent C cloudiness was observed after 24 hours' settling, but the quantity of suspended material at this time was not great enough to cause the volume to increase upon subsequent settling. The same was true for agent D. In the case of both C and D an excess of agent affected the degree of dispersion much less than

[1] Horn Research Laboratories, Inc., Long Island City, N. Y.



The Relation of Dilatancy and Flocculation to Maximum Concentration in Zinc Oxide Pastes at Given Percentages of Dispersing Agents A and B

in the case of A and B. For this reason Table 1 for C and D gives the sedimentation volume for one concentration only which is believed to represent approximately the maximum.

In the light of this test agent A clearly appears to be the most effective of the four agents concerned.

Dilatancy

While determining the maximum concentration of pigment obtainable with agent A by thoroughly mixing and kneading dry pigment and liquid with a spatula on a glass plate, a peculiar phenomenon was observed. When the pigment concentration became very high, for example, 76% by weight of zinc oxide, the paste became glossy and free flowing like heavy oil. Yet this liquid adhered tenaciously to the glass plate and offered tremendous resistance to any outside force attempting to move, agitate, or dislocate it. The harder it was forced, the greater would be the resistance it offered. When an attempt was made to thrust a knife quickly into a large quantity, the material behaved like an elastic solid. The glossy mass became dull and rough in appearance where the knife struck the surface. Immediately after the knife thrust the material began to flow and leveled out so that no trace of the indentation remained. This cycle could be repeated at will. When a spatula was quickly drawn over the material on a glass plate, a similar effect was observed.

Certain finely ground minerals such as diamond, quartz, and glass, and a few other substances such as starch have been found to display such a behavior[2, 3] without dispersing agents present. Also, ordinary beach sand has been found to behave similarly.[4] This phenomenon has been termed "dilatancy."

Dilatancy has been associated with close packing of solid particles or their uniform distribution in a liquid medium. If there is just enough liquid present in a system to wet all particles when they are most closely packed, any disturbance of this arrangement must necessarily produce a less close packing of the particles with the result that the water is drawn into the enlarged interstices and the whole system turns dry and hard. If the cause of the disturbance is eliminated, the particles, under certain conditions, will return to their original position either without the aid of outside influence or by tapping the container slightly. The behavior of the material in the former case is referred to as "active dilatancy" and in the latter case as "passive dilatancy."

Natural vs. Induced Dilatancy

To the best of the author's knowledge the above phenomenon has never been previously discussed in the literature in connection with dispersing agents. Dilatancy has always been understood to be an inherent property of certain minerals and other substances. No case has been reported before where, by the addition of a dissolved chemical, dilatancy has been artificially induced in a substance which by itself shows no trace of this property.

Naturally dilatant substances do not exhibit so marked a degree of this characteristic as can be obtained through the use of an effective dispersing agent; they are not so fluid, or do they resist a change in particle arrangement to the extent that is found in induced dilatancy. This may be partly due to the fact that zinc oxide has strongly anisometric particles; while most naturally dilatant substances which have been investigated have more or less spherical particles.[5] It seems understandable that anisometric particles interfere more with each other than spheres do; hence the latter lend themselves better to dilatant behavior, the former to thixotropy. However, if an anisometric system can be made to pack closely, any disturbance in the packing is of greater consequence than with spherical particles. The dilatancy becomes more pronounced.

Because a pigment becomes both well dispersed and actively dilatant when treated with agent A, the existence of a close relation between these two phenomena is apparent. This relation had been assumed by Freundlich[2, 3] for naturally dilatant systems.

Relation of Pigment Concentration to Dilatancy, Flocculation, and Thixotropy

The relation between pigment concentration on the one hand and dilatancy and flocculation on the other has been

[2] H. Freundlich and A. D. Jones, *J. Phys. Chem.*, 40, 9, 1217-36 (1936). See also H. Freundlich, *Royal Inst. Grt. Brit.*, Mar. 20, 1936, pp. 1-27.
[3] H. Freundlich and H. L. Röder, *Trans. Faraday Soc.*, 34, 308-16 (1938).
[4] O. Reynolds, *Phil. Mag.*, (5), 20, 459 (1885); *Nature*, 33, 429 (1886).
[5] E. A. Hauser, "Colloidal Phenomena," McGraw-Hill, 1939, p. 225.

examined and is recorded in the accompanying graph. The maximum concentration of pigment obtainable with different amounts of agents A and B has been plotted. Active dilatancy takes place only in the approximate range indicated, i.e., where the top curve is at a maximum. As the maximum concentration obtainable decreases, active dilatancy becomes less pronounced. Instead of flowing down a spatula rapidly and in thin strings, the mass flows slowly and in broad bands, and, as the maximum concentration further decreases, the paste ceases to flow by gravity alone. In this state (passive dilatancy) slight tapping of the spatula is required to produce flow. The lower curve, representing agent B, at no point goes above the stage of passive dilatancy. At a still lower maximum concentration the material passes into that state where it no longer displays dilatancy of any type, i.e., will not flow even when agitated. Here the paste is completely flocculated. Further observations on the behavior of agent A are presented in Table 2.

TABLE 2. EFFECT OF VARIOUS CONCENTRATIONS OF AGENT A ON PROPERTIES OF ZNO

1. For 5 gr. ZnO—*2.75* c.c. water (no dispersing agent present) necessary to just make homogeneous paste.
   Description —Very stiff. With 5 more c.c. it is still a paste, without a trace of passive dilatancy. Upon tapping a horizontally held spatula, material piles up instead of flowing down.
2. For 5 gr. ZnO—*2.45* c.c. of ½% agent A solution necessary to just make a homogeneous paste.
   Description —No dilatancy. 1.1 c.c. additional solution necessary to liquefy paste, which still does not flow because it is thixotropic with very short time of solidification.
3. For 5 gr. ZnO—*2.19* c.c. of 1% agent A solution necessary to just make a homogeneous paste.
   Description —Still appears like ordinary paste, but slightly passively dilatant. 0.4 c.c. additional solution liquefies. Resulting product behaving as (2).
4. For 5 gr. ZnO—*1.77* c.c. of 2% agent A solution necessary to just make homogeneous paste.
   Description —Distinctly passively dilatant. Liquefied by one more drop (0.04 c.c.). Slightly thixotropic with much longer time of solidification than (2) and (3).
5. For 5 gr. ZnO—*1.56* c.c. of 4% agent A solution necessary to just make homogeneous paste.
   Description —Very actively dilatant. Completely liquefied by one drop. No measurable thixotropy.
6. For 5 gr. ZnO—*1.63* c.c. of 5.6% agent A solution necessary to just make homogeneous paste. Otherwise like (5).

It was noted in these experiments that with relatively small amounts of agent A and at less than maximum pigment concentration the system became distinctly thixotropic. This means that flocculation, thixotropy, passive dilatancy, and finally active dilatancy must be regarded as various stages of dispersion with no sharp demarcation line separating one stage from the other.

Freundlich[2] correlates these factors as follows.

TABLE 3

Close Packing	*Loose Packing*
Small volume of sedimentation	Large volume of sedimentation
Dilatancy	No dilatancy
No plasticity	Plasticity*
No thixotropy	Thixotropy

*Plasticity is another term for what is described in this paper as "paste-like consistency," or as the behavior of a paste having a distinct yield value.

Dispersion is not mentioned in this connection at all; yet according to the evidence that has been presented, dispersion is the connecting link between all the properties mentioned. Close and loose packing are not to be regarded as opposing principles, but as the outer limits for the entire range of dispersion, from complete flocculation, to complete dispersion. All intermediate stages exist and can be produced in flocculated systems of any type by the addition of the proper quantities of certain surface active agents.

This relation, although recognized, has not been brought out quite as clearly before because the gradual transition of a substance through the stages from flocculation to active dilatancy was unknown. There are probably few chemicals of such high efficiency as agent A, and most dispersing agents are not effective enough to produce systems exhibiting active dilatancy. For instance, agent B is capable only of producing systems that are passively dilatant, and agents C and D at best produce systems showing weak signs of passive dilatancy.

Dilatancy in Other Pigment Dispersions

Many pigments in addition to zinc oxide can be made actively dilatant. Among them are: antimony oxide, lead carbonate, toluidine toner, chrome yellow, and chrome orange. Results of sedimentation tests on chrome yellow dispersions are shown in Table 4.

TABLE 4

0.973 grams chrome yellow (equaling ⅛ c.c. displacement volume) plus 9.83 c.c. aqueous solution in a 10 c.c. graduate.

	Days of Settling				
	1	2	3	4	5
	No. of Cu.Cm. of Sediment				
No Agent	9.8	9.4	9.2	9.2	9.2
0.29% Solution (Agent A)	1.50	1.55	1.56	1.57	1.57
0.29% Solution (Agent C)	4.10	4.10	4.05	4.02	4.02
0.29% Solution (Agent D)	5.52	5.52	5.50	5.50	5.50

Again agent A has the smallest sedimentation volume, i.e., is the most effective dispersing agent. Other dispersion tests, including microscopic examination, when compared with dilatancy effects, support the contention that active dilatancy is only found where a most effective dispersion takes place. Therefore it is believed that dilatancy can be used as a rapid and convenient method of indicating good dispersing agents. This is true only when comparing systems of commensurate particle size, especially microscopic dimensions. Both specific weight and size of the particles have a bearing on the above described phenomena.

Although it is true that actively dilatant systems always exhibit the highest degree of dispersion, it is likewise true that there may still be many agents which will disperse a pigment fairly well without producing an actively or passively dilatant system. The absence of active dilatancy does not necessarily mean that no dispersing effect can be obtained, but rather that a certain very high and stable degree of dispersion cannot be reached.

The same dispersing agent may not be equally effective for all pigments. However it has been found that dispersing agents which produce dilatancy generally have a broader range of applicability than those which do not. Agent A disperses a greater number of different pigments than any other dispersing agent that the author has tried. However not all of these pigments have lent themselves to becoming actively dilatant.

Dilatancy vs. Consistency

A discrepancy exists between the dilatancy and sedimentation volume tests on the one hand and the consistency test on the other hand in the case of agent C. This discrepancy cannot be fully explained as yet, but there is cause to believe that the former tests are more reliable. Agent C has a stronger liquefying effect than agents A and B, but produces no dilatancy. At 76% concentration, zinc oxide mixed on a glass plate with a solution of agent A flowed like a viscous oil. When a solution of agent C was used, however, a paste of the same concentration was thin and watery, flowing from a spatula in distinct, single drops.

The difference between the two types of dispersing agent appears even greater when considering the maximum concentration of pigment that can be employed in the production of a homogeneous paste. Owing to the high resistance of dilatant systems to mechanical force a Banbury mixer was used in the production of these highly concentrated pastes.

Using agent C, a smooth 87.5% zinc oxide paste with a comparatively low yield value was thus made. When thinned with water 1% to 2% below this concentration, the paste turned into a thin liquid. The most concentrated paste that could be obtained with agent A of the highest possible purity was one containing 86.6% zinc oxide. Above that concentration the mass became dry, crumbly, and incoherent. With agent A of technical quality the highest concentration of zinc oxide obtained was 86.0%.

However dispersions made from agent C have a paste-like character in only a very narrow range of concentration; they are usually either fluid or dry and lumpy. In the paste state such dispersions do not flow and have a yield value. If a paste of this type is forced against the walls of a containing vessel with a spatula, two separate phases are formed, one consisting of dry lumps and the other of a thin, watery liquid. These lumps do not liquefy when allowed to remain undisturbed, or do they liquefy upon tapping. The dispersion has apparently been destroyed by mechanical forces. Upon further addition of zinc oxide the entire mixture becomes dry, lumpy, dull, and irreversible.

On the other hand a zinc oxide dispersion using agent A, after passing through an extremely fluid stage at low concentrations, enters a range, upon increasing the concentration, where it is neither liquid nor dry and lumpy. This range is fairly broad, from 73% to about 86% zinc oxide. In this range the paste is actively dilatant; dry lumps of a lasting nature cannot be formed in one portion while another portion remains fluid. Either the whole system is dry and dull or is smooth and mobile. No two phases can be produced by pressure as in the case of a dispersion with agent C.

As a further distinction between highly concentrated pastes made from agents A and C, pastes containing C offer little resistance to a knife thrust, while those containing A resist such a thrust forcibly, and the whole mass exhibits elastic deformation. In spite of this difference in the character of agent A and C pastes, it is believed that the assumed relation between dilatancy and dispersion generally holds true; i.e., wherever dilatancy exists there must be excellent dispersion.

Dispersion and Particle Adhesion

The nature of the adhesion forces between particles has been discussed by Buzagh.[6] The two main factors that determine the degree of adhesion are the ζ potential and the thickness and deformability of the solvation layers around the particles. Buzagh calculates the adhesion forces between particles to be in the neighborhood of 0.3 dyn/cm^2; under certain conditions, however, they may become as high as 3 to 6 dyn/cm^2.

In the case of agent A only one of the factors involved is known, the ζ potential, which can be measured by cataphoresis. It is extremely high, between 65 and 106 millivolts, depending upon the degree of purity of the product. Agent B, from which agent A is derived, has a ζ potential lower than that of A. This would seem to indicate that the difference in the dilatancy effect produced by the two agents may be dependent largely upon the magnitude of the ζ potential. In other words, whatever the role of the solvation layer may be, which is not known in this case, a high ζ potential appears to be a main factor in producing actively dilatant systems, i.e., in preventing the attractive or adhesive forces between particles from becoming dominant.

In the case of agent C the particles appear to keep apart only under favorable conditions (for example, in dilute systems). The repelling forces do not prove strong enough to keep the particles apart when they are forcibly and closely packed together as in the production of highly concentrated pastes. The adhesion forces under these conditions become predominant, and the material will not flow again even if subjected to vibration. It may be that the character of the liquid medium is changed by C, allowing the solvation layers to become deformed by force to the extent that the particles become associated with each other in a manner similar to the molecules in a solid, but unlike the original loose aggregates which occluded so much water. These original loose aggregates, after being destroyed by the effect of the dispersing agent, give way to a closer packing of the particles. Only after this preliminary packing has taken place does it become possible for outside (mechanical) forces to cause the particles to come so close together that attraction of a higher order of magnitude came into play. This explanation of the behavior of the paste seems entirely possible in the light of Buzagh's investigation.

In actively dilatant systems the repelling forces apparently are so strong that a pattern is established with the particles tending to keep equally distant from each other. If this pattern is upset by outside forces, the resulting effect is only temporary. As soon as the cause of disturbance is removed, the particles, under the influence of the strong repelling forces, resume their former equidistant relation; the mass levels out quickly and becomes glossy again.[3] The repelling forces increase as the particles are brought nearer together by impact. The occurring rebound may explain the elasticity found in dilatant systems.

Passively dilatant systems must be assumed to be partly flocculated, or at least to have a less orientated and rigid pattern with weaker repelling forces than in the case of active dilatant systems. The higher amount of water required upon mixing a paste and the fact that excess moisture appears upon tapping bears this out. The thixotropic character of these systems also points to the existence of weak and reversible adhesion forces.

Passive dilatancy and thixotropy are the intermediate steps between complete dispersion and complete flocculation. Where neither active nor passive dilatancy exists and yet highly concentrated pastes can be made, as in the case of agent C, good dispersion may take place only under certain favorable conditions, for example, in dilute systems.

---

[6] A. von Buzagh, *Kolloid-Z.*, 51, 105-12, 230; 52, 46-61 (1930).

Effect of Electrolytes on Dilatant Systems

While mechanical forces fail to change the degree of dispersion of actively dilatant systems, the reduction of the electrokinetic forces below a certain critical value will have an instantaneous destructive effect. The addition of small amounts of electrolytes will change an actively dilatant system to one that is passively dilatant. Larger amounts will bring about complete flocculation. Thus we can reverse step by step the direction on the dispersion scale.

Except for minor deviations from the rule, the *coagulating* effect of electrolytes on hydrophobic sols parallels their ability to decrease the cataphoretic velocity of the dispersed particles. In the same way the influence of the electrolytes on *flocculation* is governed by the valency rule; tri-valent cations such as aluminum are about 10 times as effective as di-valent cations such as barium, strontium, and calcium (in order of their effectiveness) and about 100 times as effective as mono-valent ions such as potassium, sodium, and lithium (in order of effectiveness). Free hydrogen ions are even more destructive to dispersions than tri-valent cations.

The parallelism between the increase of adhesion between particles and the increase in electrolyte concentration is fairly strict and holds for all dispersions. In general the influence of electrolytes on the dispersion does not result from chemical reactions with the pigment or dispersing agent, but from the effect on the ζ potential of the particles and on the solvation layers. This must be kept in mind when working with dispersing agents. No matter how good a dispersing agent may be, the presence of certain salts or acids will effectively counteract its dispersing effect. Electrolytes will also destroy the natural dispersability of a system without dispersing agents.

Summary

1. In Part I the difference in the functions of wetting, dispersing, and protecting agents is discussed, and explanations of the different mechanisms by which they act are suggested.

2. The known methods for testing dispersion are cited.

3. In Part II the dispersing qualities of four different types of agents are compared by the method of sedimentation volume. From the results of this test a newly discovered dispersing agent appears to be the most efficient of the four agents tested.

4. It is found that this new agent has the peculiar property of making a number of pigments actively dilatant. Dilatancy was previously known only as an inherent property of certain substances, not as a property which can be induced by means of surface active agents.

5. Dilatancy is linked with dispersion. It is shown that flocculation, thixotropy, passive dilatancy, and finally active dilatancy can be regarded as different states of dispersion, with no distinct line of demarcation between them. Active dilatancy is obtained only at a most complete degree of dispersion.

6. The dilatancy test is regarded as a quick and convenient method of evaluating dispersions in all cases where dispersions of a relatively high degree are obtained.

7. An inconsistency in the results between the sedimentation volume and dilatancy tests on the one hand and the consistency test on the other hand is discussed. Systems containing agent C show no dilatancy and have a relatively large sedimentation volume; yet they remain fluid at concentrations even higher than those reached by dilatant systems. This discrepancy cannot be fully explained, but it is not believed to invalidate the above deductions on the relation between dilatancy and small volume of sedimentation on the one hand and dispersion on the other hand.

8. The mechanism of dilatancy is discussed. The ζ potential and hydration are assumed to be the most important factors. With the addition of discharging cations, dilatancy is gradually destroyed and the state of dispersion reversed.

Acknowledgment

The writer is indebted to Prof. H. Freundlich and to E. V. Osberg for their helpful advice and criticism and to Mrs. R. Daniel for providing the experimental data for this article.

Goodyear Latex Arrives in Baltimore

FIRST shipment of latex from the Far East for the new Goodyear Tire & Rubber Co. dock storage warehouse in Baltimore, Md., arrived in December. The latex, to be used for the manufacture of Airfoam and Pliofilm, was transferred to six 30,000-gallon storage tanks in the upper section of the warehouse. Tank cars are placed below these storage tanks, filled by gravity, and shipped to Akron.

A portable pump, used on the dock or in the ship's hold, pumps the latex from the hold, through a steel pipe line, and into storage. When the latex level gets down within a foot of the tank bottom, men, in rubber suits and boots and with gas masks to protect against ammonia fumes, push the residue with rubber squeegee paddles toward the outlet. When inside the storage tank, the latex is slowly circulated through the tank proper and an adjacent tunnel by means of electrically driven paddles.

Two new 10,000-gallon tank cars for shipment from storage are of steel, insulated with six inches of cork and lined with a specially treated lining which is protected from ammonia on the inside with Pliolite. Before loading, the tank cars are preheated to 80° F., and shipping schedules must not permit over a 15° F. drop in temperature during transit. A pressure valve automatically releases any pressure build-up within the tank. Upon arrival in Akron, the latex is blown out of the tank cars by compressed air into storage until needed.

Care in Storing Crude Rubber[1]

FROM information obtained from standard references, it would appear that dampness is the chief cause of mold in rubber. Mold does not make rubber worthless for use in manufacture, but does cause a serious loss of weight over a long period of time. Storage directly on concrete floors is not recommended if there is any likelihood of the floors becoming damp. This possibility may be eliminated by the use of wooden runners. Storage of rubber in the light or the direct rays of the sun is destructive. If the rubber is packed in bales, it should not be stacked to a great height, as under such circumstances the rubber in the lower bales becomes too tightly packed and causes extra work before its use in manufacture. Dust and dirt, of course, both are very harmful to rubber in storage.

[1] Abstracted from *Rubber News Letter*, Nov. 30, 1939, pp. 237-39.

Distribution of Flock Size in the Creaming of Hevea Latex[1]

E. M. McColm[2]

WHEN a mucilaginous creaming agent is added to ammonia-preserved *Hevea* latex, creaming is observed to begin after a short or long period of induction which depends on the nature of the creaming agent and on certain characteristics of the latex. The formation of a relatively sharp dividing line between cream and serum is observed to occur almost as soon as creaming begins, and the progress of the creaming may be followed by observing the rise of this dividing line.

Baker[3] reported the presence of reversible flocks in highly dilute latex containing creaming agent and indicated that the ability to cause the formation of these aggregates is what characterizes a creaming agent; presumably, then rapid creaming results because the rise of these flocks occurs much faster than the rise of individual latex globules.

Twiss and Carpenter[4] indicated that creaming comprises two stages: (1) rise of the flocks, followed by (2) contraction of the network of flocks as the result of packing.

The rate of rise of the cream-serum dividing line, at least at the start of creaming, is a measure of the rate of rise of the smallest and slowest moving flocks present in the cream. The concentration gradient upward through the cream at any given time in the early stages of creaming is a measure of the size distribution of flocks set up by the particular creaming agent used. Measurement of this concentration gradient enables calculation of the flock-size distribution, a property which is of value in studies of creaming phenomena.

Theory of Flock Distribution

The method used to measure this property is an adaptation of the usual methods of sedimentation analysis.

A single flock, suspended in latex serum, will rise according to Stokes' law:

$$v = \frac{2\ r^2 g\ (P - p)}{9\eta}$$

where v is the velocity of rise of the flock, r is its "effective" radius, g is the force of gravity, P is the density of the medium, p is the density of the flock, and η is the viscosity of the serum. Since the flock is irregular in shape, it may contain pockets filled with serum and may also include a certain amount of adsorbed hydrated substances, which cause it to drag upward a certain amount of bound water. The value of r is the radius of a sphere having the same density as the mean density of the flock, plus all occluded and bound substances, and the same rate of rise. In effect, r, therefore, is more a function of the velocity of rise than of size and for the present purpose is termed "effective" radius.

According to the above equation, the velocity of rise is constant. If, however, the rise of the cream-serum dividing line is plotted against time, it is found to follow the general equation of the second degree during the early hours of creaming with certain creaming agents:

$$At^2 + Bty + Cy^2 + Dt + Ey + F = 0 \quad \ldots\ldots (1)$$

where t is the time from the beginning of creaming, and v is the height of the cream-serum line. The values of the constants are such that the curve is hyperbolic. There is, therefore, a negative acceleration acting on the lowest flocks from the beginning of creaming. This is presumed to be the effect of repulsive forces set up between flocks, in other words, to be the effect of packing. As a result, the true Stokes'-law velocity would only be observed for any given flock, when it is infinitely distant from another.

This requirement of infinite separation can be considered as satisfied if y is set equal to negative infinity. Consequently the slope of the curve represented by equation (1) at this point, which is equal to the slope of the asymptote, is the true Stokes'-law velocity of the flocks in the cream-serum dividing line. If we let V_o be the true Stokes'-law velocity, its magnitude is thus given by the expression:

$$V_o = \frac{1}{2C}\left[\pm (B^2 - 4\ AC)^{\frac{1}{2}} - B \right] \quad \ldots\ldots (2)$$

At any other time, or value of y, the velocity of these smallest flocks is:

$$V_t = \frac{dy}{dt} = \frac{1}{2C}\left[\pm \frac{2\ Gt + H}{2(Gt^2 + Ht + I)^{\frac{1}{2}}} - B \right] \quad \ldots\ldots (3)$$

where $G = B^2 - 4\ Ac$, $H = 2\ BE - 4\ CD$, and $I = E^2 - 4\ CF$. It is self-evident that

$$V_t < V_o$$

or it can be written that

$$V_t = V_o / m_t$$

where m_t is so chosen that

$$m_t = V_o / V_t \quad \ldots\ldots (4)$$

The quantity m will vary with time and with height, but at any given instant during the early part of the creaming, and in the lower portions of the latex, its magnitude for all flocks should be about the same and can be estimated using equation (4), determining V_o and V_t from equations (2) and (3) respectively.

It can be seen from Figure 1 that the value of dy/dt remains practically unchanged during the early part of the creaming; in other words the curve is not very different from a straight line during this period. Hence dy/dt at any point in this straight line portion is not appreciably different from y/t', where t' is the time from the actual beginning of creaming. Since this is true for the flocks in the cream-serum dividing line, it is assumed to be true for all other flocks, and therefore, provided this assumption is not far from the truth, we have a means of approximating r from V_t when m is known.

In order to get a conception of the magnitude of the flock-size distribution, the following procedure, an adaptation of the usual methods, is resorted to:

Let S_o be the initial fractional total solid content of

[1] Presented before the Division of Rubber Chemistry, A. C. S., at the Baltimore meeting, Apr. 3 to 7, 1939.

[2] Research performed while in Plantation Research Department, Plantations Division, United States Rubber Co., Boenoet, Kisaran, Sumatra, East Coast; present address, Plantations Division, U. S. Rubber, North Bergen, N. J.

[3] H. C. Baker, *Trans. Inst. Rubber Ind.*, 13, 70 (1937).

[4] Rubber Technology Conference, London, May, 1938.

the latex, $S_{y;t}$ be the fractional total solid content of the latex at the height y and time t after creaming has begun, and s be the fractional total solid content of the serum, i.e., of the medium through which the flocks rise. It is assumed that s is constant throughout.

The weight of water present in one gram of latex or cream is $1-S$, and consequently the weight of serum which would separate if creaming could be carried out to yield a cream containing no remaining serum is $(1-S)/(1-s)$. Hence the weight of flocks present which do, or could cream is $1-(1-S)/(1-s)$, or $(S-s)/(1-s)$.

Now consider a size distribution function of these creaming flocks, z, such that:

$$\frac{d\ (S_o-s)}{dr\ (1\ -s)} = z$$

or, in the original latex before creaming has begun:

$$S_o = s + (1-s)\int_{r_o}^{R} zdr \quad \ldots\ldots (5)$$

where R is the "effective" radius of the largest and/or fastest-moving flock, and r_o is the "effective" radius of the smallest and/or slowest-moving flock, which is present.

At the level y after t seconds of creaming there will be present all flocks originally from the lowest level in the container which could just move the distance y in time t, plus all flocks of successively smaller size and/or slower speed, which were initially present in successively higher levels in the container, down to the flocks of smallest size which are present. That is to say

$$S_{y;t} = s + (1-s)\int_{r_o}^{r_y} zdr$$

where r_y is the "effective" radius of the flock which can just move the distance y in time t.

S_t varies with height; hence

$$\frac{dS_t}{dy} = (1-s)\,z\,\frac{dr_y}{dy}$$

But from equation (4) and Stokes' law, and taking dy/dt equal to y/t':

$$r_y = (Km_t y/t')^{\frac{1}{2}} \quad \ldots\ldots (6)$$

where $K = 9\eta/2g(P-p)$

Then $dr_y/dy = Km_t/4yt')^{\frac{1}{2}} = r_y/2y$

Therefore $z = dS/dy\ .2y/r_y(1-s) \quad \ldots\ldots (7)$

Values of r are calculated from equation (6) for different values of y, and the corresponding values of z are then calculated from equation (7). If the values of z are plotted against the corresponding values of r, a distribution curve of "effective" flock radius results, for in such a plot the area under the curve between any two values of r represents the weight fraction of creaming material having "effective" flock radii between the limits chosen.

In order to calculate these values of z, dS_t/dy is first obtained by sampling at different levels at some particular time shortly after creaming has begun, plotting values of S_t against corresponding values of y and determining the slopes of this curve at different points graphically or by interpolation methods.

In order to calculate K, the values of the viscosity of the medium, i.e., of the serum which separates ($=\eta$), as well as the densities of the serum ($=P$), and of the creaming flocks ($=p$), must be known. The first two quantities are measured in the usual way. The last may be calculated as follows:

Let d_1 be the density of the original latex. The volume occupied by one gram of original latex is $1/d_1$, and that occupied by the serum present is $(1-S_o)/P(1-s)$. The volume occupied by the creaming material is thus:

$$1-\frac{1-S_o}{\dfrac{1-s}{p}} = \frac{S_o-s}{p(1-s)}$$

Assuming additivity of volumes in the usual manner, we then have:

$$\frac{1}{d_1} = \frac{1-S_o}{P(1-s)} + \frac{S_o-s}{p(1-s)}$$

Whence: $$p = \frac{d_1\ P(S_o-s)}{P(1-s)-d_1(1-S_o)}$$

Experimental Procedure

A quantity of ammonia-preserved latex, nine days old, was placed in a water bath held by a thermostat at 30° C., together with quantities of water solutions of two different creaming agents. The following morning the latex and creaming agents were quickly mixed, making up four samples, two for each creaming agent. Two samples were set up in ten-liter cylinders and two in two-liter cylinders, and all were quickly returned to the water bath. The characteristics of these samples are shown in Table 1.

Table 1. Characteristics of the Creaming Samples

Sample	1	2	3	4
Creaming Agent	A	A	B	B
% Creaming Agent Content, Based on the Water	.12	.12	.14	.14
% Soap	.20	.20	.20	.20
% Total Solid Content, Not Including Creaming Agent	35	35	35	35
% Total Solid Content, Including Creaming Agent	35.28	35.28	35.29	35.29
Size of Container, Liters	10	2	2	10
Total Height of Latex, Cm.	37.00	37.03	37.46	36.14

The two ten-liter cylinders were each fitted with ten glass sampling tubes of 2 mm. bore paraffined to the inside walls of the cylinders, and of different length so as to permit sampling from different levels. Observations were made with a cathetometer, every twenty minutes, of the heights of the cream-serum dividing line in each cylinder until the samples were withdrawn from the two larger cylinders. Subsequent observations were made only in the two-liter cylinders.

When the serum line had nearly reached the outlet of the longest sampling tube in each ten-liter cylinder, samples were withdrawn from each tube. These samples were taken, using gentle suction in order to draw mainly latex from the level of the tube end. By taking the samples consecutively downward changes in sampling level were avoided.

The cream samples thus obtained were analyzed for total solids content. Subsequently samples of the serums from the two creamings, taken immediately after the cream sampling, and samples of the original latex after mixing the creaming agents, were analyzed for the various properties which had to be known, as discussed under "Theory of Flock Distribution."

The data obtained are shown in Tables 2, 3, and 4. The values of y had previously been obtained by measuring to the nearest 0.01 cm. the distance of the open end of each sampling tube from the bottom of the container.

TABLE 2. RISE OF CREAM-SERUM DIVIDING LINE

Time in Min. after Mixing Creaming Agents	Height of Cream-Serum Dividing Line in Cm.			
	1	2	3	4
0	0	0	0	0
20	0	0.42	0	0
40	0.19	2.52	0	0
60	2.19	3.22	0	0
80	3.49	4.33	0.23	0
100	Sampled	5.58	0.34	0
120		6.42	0.64	0.34
140		7.64	0.99	0.67
160		8.52	1.12	0.98
180		10.29	1.37	1.25
200		11.41	1.95	1.82
220		11.70	2.43	2.59
240		11.75	2.89	2.84
260		12.09	3.09	3.03
280		12.63	3.68	3.57
300		12.95	4.03	4.11
320		13.25	4.46	4.74
340		13.34	5.24	Sampled
360		13.49	5.79	
380		13.73	6.20	
400		13.82	6.86	
420		14.01	7.47	
440		14.10	8.17	
460		14.20	8.71	
480		14.40	9.45	
500		14.53	10.11	
520		14.57	10.52	
540		14.65	10.92	
560		14.75	11.23	
580		14.85	11.56	
600		14.90	11.80	
620		14.94	12.00	
640		14.97	12.17	
660		15.02	12.34	
680		15.05	12.43	
700		15.16	12.55	
720		15.20	12.63	
740		15.23	12.72	
760		15.25	12.85	
780		15.26	12.89	
800		15.30	13.01	
820		15.33	13.12	
840		15.38	13.17	
860		15.40	13.24	
880		15.41	13.30	
900		15.43	13.34	
920		15.46	13.47	
940		15.47	13.49	
960		15.48	13.51	
980		15.49	13.54	
1000		15.50	13.59	
1020		15.50	13.62	
1040		15.50	13.70	
1060		15.50	13.72	
1080		15.50	13.76	
1100		15.51	13.80	
1120		15.52	13.82	
1140		15.53	13.92	
1160		15.54	13.94	
1180		15.55	13.98	
1200		15.56	14.07	
1220		15.57	14.12	
1240		15.58	14.15	
1260		15.59	14.18	
1280		15.60	14.19	

TABLE 3. TOTAL SOLIDS CONTENTS OF SAMPLES OF CREAM TAKEN FROM DIFFERENT LEVELS

Sample 1 Creaming Agent A (Sampled 74 Min. after Creaming Began)			Sample 4 Creaming Agent B (Sampled 214 Min. after Creaming Began)		
Sample No.	Height of Sample above Bottom, Cm.	% T.S.C.	Sample No.	Height of Sample above Bottom, Cm.	% T.S.C.
a	5.44	25.59	a	6.07	13.42
b	7.47	35.66	b	8.42	23.75
c	9.55	35.87	c	10.30	28.37
d	11.38	36.21	d	12.26	31.84
e	13.23	36.34	e	13.88	36.52
f	14.98	36.46	f	16.81	40.46
g	16.68	36.42	g	19.02	41.75
h	19.70	36.95	h	20.99	43.01
i	21.63	36.46	i	22.80	44.19
j	24.82	37.21	j	24.92	45.39
% T.S.C. serum	5.89		% T.S.C. serum	6.84	

TABLE 4. VISCOSITIES AND DENSITIES AT 30° C.

	Creaming Agent A	Creaming Agent B
Density of Latex, after Mixing Creaming Agent	0.9658	0.9680
Density of Serum	1.0084	1.0086
Density of Creaming Flocks	0.8836	0.8870
Viscosity of Serum, in Poises	0.0446	0.0179

Calculation of Results

The data shown in Table 2 are plotted in Figure 1.

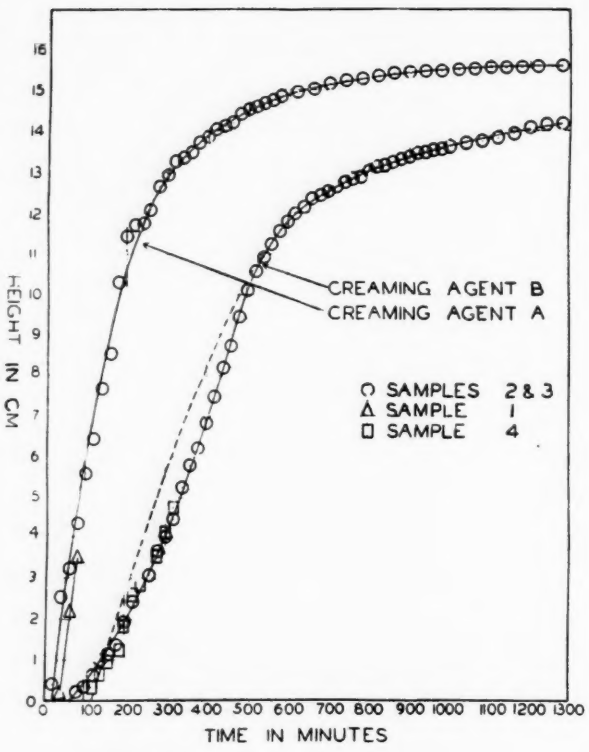


Fig. 1. Rise of Cream Serum Dividing Line

It will be seen that the curves for samples 1 and 2 are parallel; while those of samples 3 and 4 are practically coincident.

The equations for the curves of samples 2 and 3 are as follows:

Sample 2

The constants of the equation were found by using five points spaced over the first twenty hours. The equation is as follows:

$$.0006486\ t^2 + ty - 7.2069\ y^2 - 17.4173\ t + 171.7667\ y + 337.78 = 0$$

Sample 3

Certain assumptions were necessary. It was assumed that the increase in rate over the first 200 minutes represented a period during which the flocks were increasing in size. Extrapolating the curve downward prior to the first 500-minute period gives the approximate path which would have been followed had the flocks all been formed in their full size at once, as was apparently the case in sample 2. The equation developed, therefore, represents the broken-line curve shown in Figure 1.

$$-.001705\ t^2 + ty - 29.949\ y^2 - 11.466\ t + 317.707\ y + 729.60 = 0$$

In this case the origin is taken at the point where $y = 60$.

The agreement of these equations with some of the observed data is shown in Table 5.

The first five values shown in the tables are those used in determining the constants of the equations.

The "observed" values for the creaming-agent-B curve are those read off from the broken curve below 500 minutes.

From these equations the values of m were calculated by the method given under "Theory of Flock Distribution" to be 1.967 for creaming agent A after 74 minutes of creaming, and 1.072 for creaming agent B after 214 minutes of creaming.

TABLE 5. AGREEMENT BETWEEN CALCULATED AND OBSERVED VALUES OF THE EXTENT OF CREAMING

Creaming Agent A				Creaming Agent B			
t, Min.	y (Calc.)	y (Obs.)	Diff.	t, Min.	y (Calc.)	y (Obs.)	Diff.
60	3.40	3.40		280	4.74	4.90	
160	9.15	9.15		460	9.60	9.60	
400	13,82	13,82		660	12.34	12.34	
800	15.30	15.30		1060	13.72	13.72	
1280	15.70	15.60		1280	14.20	14.20	
80	4.85	4.33	— .52	360	7.04	7.15	+ .11
100	6.14	5.58	— .56	400	8.12	8.25	+ .13
300	12.70	12.95	+ .25	560	11.40	11.23	— .17
500	14.47	14.53	+ .06	600	11.86	11.80	— .06
600	14.87	14.90	+ .03	760	12.85	12.85	0
700	15.13	15.16	+ .03	800	13.00	13.01	+ .01
900	15.42	15.43	+ .01	860	13.24	13.20	— .04
1000	15.50	15.50	0	960	13.48	13.51	+ .03
1100	15.56	15.51	— .05	1100	13.81	13.80	— .01
1200	15.59	15.56	— .03	1160	13.95	13.94	— .01
Total			+ .78	Total			— .01
Mean Square Deviation			.06554	.....			.00643
Standard Error			.256	.....			.080

TABLE 6. VALUES OF r AND z

Creaming Agent A				Creaming Agent B			
y in cm.	r in cm. x10⁻⁴	dS/dy	z	y in cm.	r in cm. x10⁻⁴	dS/dy	z
4.2	16.179			4.5	4.246		
5.5	18.517	.10667	673.3	6.0	4.903	.04000	1050.9
6.0	19.596	.08842	581.9	7.0	5.296	.03708	1052.1
6.5	20.394	.02253	154.6	8.0	5.662	.03368	1021.6
7.0	21.152	.00765	54.4	9.0	6.005	.03107	999.6
7.5	21.886	.00336	24.8	10.0	6.330	.02720	922.5
8.0	22.331	.00187	14.2	11.0	6.639	.02520	896.4
9.0	23.689	.00155	12.5	12.0	6.934	.02225	826.7
10.0	24.968	.00132	11.2	13.0	7.217	.01933	747.6
12.0	27.353	.000957	8.9	14.0	7.490	.01688	677.2
14.0	29.549	.000678	6.8	15.0	7.753	.01440	598.1
16.0	31.585	.000536	5.8	16.0	8.007	.01150	493.3
18.0	33.504	.000454	5.2	17.0	8.253	.00886	391.7
20.0	35.312	.000340	4.1	18.0	8.492	.00756	344.2
22.0	37.034	.000288	3.6	19.0	8.725	.00680	317.9
24.0	38.685	.000179	2.4	21.0	9.173	.00636	312.8
25.0	39.483	.000125	1.7	23.0	9.600	.00595	305.8
				25.0	10.009	.00561	301.0

Values of z and of r were then calculated. They are shown in Table 6 and plotted in Figure 3. The values of dS/dy shown in Table 6 were obtained graphically from enlarged curves similar to the curves in Figure 2, which were plotted from the data in Table 3.

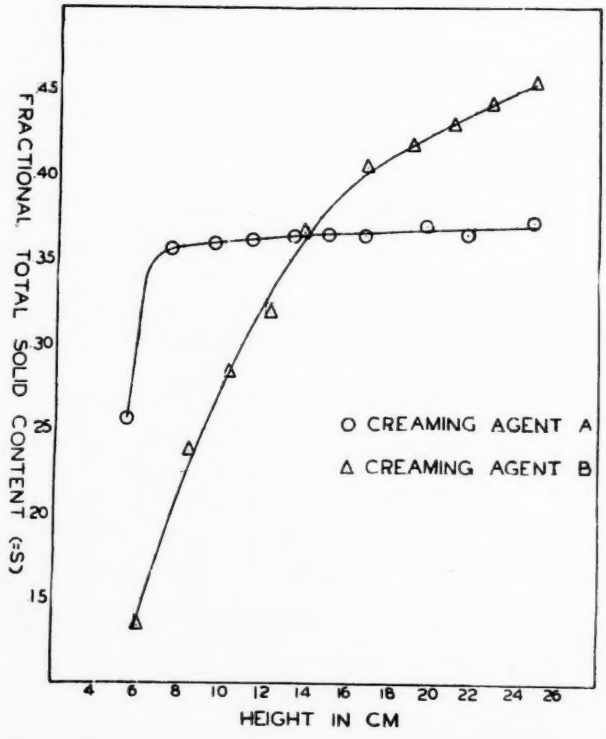


Fig. 2. Variation in Total Solid Contest with Height

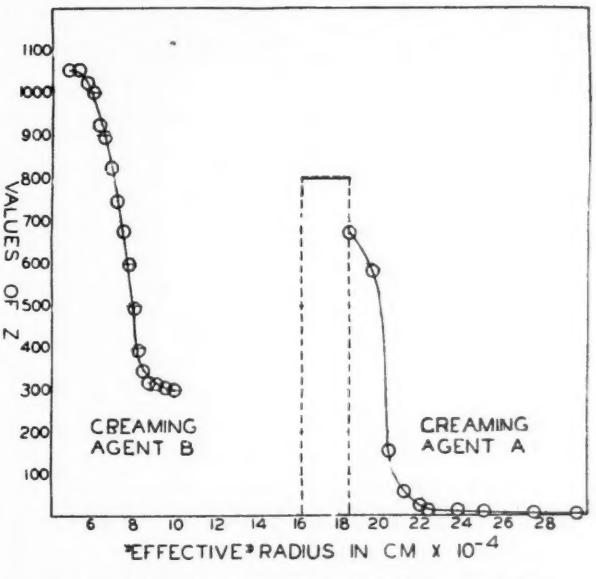


Fig. 3. Distribution Curves of Flock "Effective" Radius

In calculating the values of r the time t′ for sample 4 was taken as 134 minutes instead of 214 minutes in order that y/t would correspond to dy/dt on the broken-line portion of the creaming curve, as explained under "Theory of Flock Distribution."

Discussion

The areas, between different values of r, under the curves in Figure 3 are shown in Table 7. It will be seen that the area under this distribution curve of creaming agent A represents only 12.51% of the latex; whereas the area under the curve of creaming agent B represents 33.47% of the latex.

By the method given in the beginning of this article it may be shown that the percentages of total creaming material present in each latex are 31.23 for latex containing creaming agent A and 30.54 for latex containing creaming agent B. The distribution curves, therefore, account for only about 40% of the total creaming material of the latex containing creaming agent A, but over 100% of the total creaming material in the latex containing creaming agent B; the excess is due to errors in the total solid content analyses, in plotting, and in graphical estimation. (The total-solid content analysis is not accurate to more than about 0.2% for it has a standard error of 0.14% absolute.

TABLE 7. PERCENTAGES OF LATEX OF DIFFERENT FLOCK "EFFECTIVE" RADII

Creaming Agent A		Creaming Agent B	
"Effective" Radius in μ	% of Latex	"Effective" Radius in μ	% of Latex
18.5 - 19.0	3.30	4.9 - 5.0	1.05
19.0 - 19.5	3.09	5.0 - 5.5	5.22
19.5 - 20.0	2.78	5.5 - 6.0	5.03
20.0 - 20.5	1.42	6.0 - 6.5	4.76
20.5 - 21.0	0.41	6.5 - 7.0	4.30
21.0 - 21.5	.21	7.0 - 7.5	3.69
21.5 - 22.0	.15	7.5 - 8.0	2.82
22.0 - 22.5	.10	8.0 - 8.5	1.96
22.5 - 23.0	.08	8.5 - 9.0	1.60
23.0 - 23.5	.07	9.0 - 9.5	1.54
23.5 - 24.0	.07	9.5 - 10.0	1.50
24.0 - 24.5	.06		
24.5 - 25.0	.05		
25.0 - 36.0	.72		
Total	12.51	Total	33.47

It is evident from the shape of the curve, in the case of creaming agent A, that the unaccounted-for balance must have "effective" radii between that of the smallest

flock, 16.18μ, and that of the flock represented by the lowest observation, i.e., 18.52μ. The magnitude of this balance is indicated in Figure 3 by the dotted-line histogram.

The significance of these data and curves becomes apparent when the behavior of latex creamed with these creaming agents is considered. Latex treated with creaming agent B creams more slowly than that treated with creaming agent A, but after several days' standing it passes the latter and attains an ultimate higher total solid content of cream. It may be shown that the creaming curves of both latices change in form, after a day or two, and become rectangular hyperbolas, with asymptotes parallel to the X and Y axes. Hence it may be said that the asymptote parallel to the X axis has a higher value for the latex containing creaming agent B than for latex containing creaming agent A.

It is well known that the percentage of space occupied by spheres of a constant diameter, packed so as to have twelve points of contact, is 74.1. But the interstitial space in such a system could be filled by spheres of smaller diameter, and by making the relative size distribution infinitely wide the entire space could ultimately be occupied.

The same general idea is applicable here despite the fact that the flocks are far from spherical. It is obvious that a tighter packing, that is, a more concentrated cream, would ultimately result if a given creaming agent yields a wider relative distribution of flock size. It is apparent from Table 7 that the relative wideness of distribution of flock size, when creaming agent B is used, is much greater than when creaming agent A is used. Thus creaming agent B causes slower initial creaming because of the smaller flock size, but creaming proceeds farther because of the wider relative-size distribution.

This theory of creaming does not exclude the assumption of a semi-thixotropy occurring in the cream, whereby some degree of structure is set up, continuation of creaming consisting, in part, of the shrinking of this very weak thixotropic gel. It is to be presumed that if such does occur, the packing described above, whereby small flocks worm their way in between larger ones, occurs prior to or during the early stages of the development of the structure and assists the latter process in causing high cream total-solid contents.

Certain assumptions have been made in developing the theory of flock distribution which may not be entirely valid. Nevertheless the method is applicable to detecting relatively large differences in flock size caused by different creaming agents, and the theory of creaming developed under "Discussion" fits the known facts.

Asphalt Minus Pigment Coloration

A RECENT development of the petroleum technologist, discovered in a laboratory accident, is an asphalt virtually without pigment coloration. Because of this unique quality, it permanently can be dyed any desired color. Used without dye, it for the first time provides a practically stainless asphalt.

Several stretches of asphalt highway already have been marked with highly-visible aluminum-colored guide lines of this new material. The lines will last as long as the road surface itself, it is believed, thus eliminating the periodical application of painted lines.

Paint manufacturers also have found this new asphalt highly useful since it assimilates colors so readily. Shoe manufacturers use asphalt as a binder, but on their expensive, light-colored silk and brocaded shoes the binders made of other asphalts often came through and stained the delicate fabrics. The new asphalt does not stain.

South American Imports of Rubber Products[1]

IT IS estimated that in 1938 South American countries imported over twelve millions of dollars worth of rubber manufactures to meet their consumptive needs despite the establishment and operation of local rubber manufacturing industries in several countries. The following table, compiled largely from official trade statistics of the countries concerned, but in some cases from export statistics of countries exporting to South America, summarizes imports of rubber products by South American countries according to principal groups of products.

ESTIMATED IMPORTS OF RUBBER PRODUCTS BY SOUTH AMERICA, BY PRINCIPAL GROUPS, 1938—THOUSANDS OF DOLLARS

	Tires	Footwear	Mechanicals	Fabrics	Sundries	Others	Total
Argentina ...	945	230	645	490	250	400	2,960
Bolivia	575	10	75	10	10	5	685
Brazil	1,900	15	275	100	200	150	2,640
Chile	645	100	640	240	45	80	1,750
Colombia	1,225	35	220	150	150	40	1,820
Ecuador	130	4	25	15	5	1	180
Guianas	35	25	20	1	2	1	84
Paraguay	30	1	5	1	2	1	40
Peru	585	25	155	50	75	110	1,000
Uruguay	100	10	50	40	65	15	280
Venezuela ...	945	25	115	75	45	50	1,255
	7,115	480	2,225	1,172	849	853	12,694

American exporters of rubber products will meet increasing competition in South America from local rubber manufacturing industries in Argentina, Brazil, Chile, and Uruguay, especially in tires and tubes for automobiles, and to a lesser extent in other products in the following countries: Bolivia, practically nothing manufactured locally except a few ponchos and sheeting; Colombia, small quantities of rubber heels and soles and footwear; Ecuador, three small factories employing about 90 persons manufacturing rubber heels and soles and footwear, raincoats; Peru, two small factories and one tire retreader, products being rubber heels and soles, bands, balls, toys, tubing, footwear, mats; Venezuela, two small factories manufacturing rubber heels and soles and rubber footwear.

An idea of the rubber-manufacturing activity of South American countries may be gained from the following statistics of imports of crude rubber in 1938: Argentina, 7,653 long tons; Bolivia, none; Brazil, 3,057; Chile, 247; Colombia, 5; Ecuador, none; Guianas, none; Paraguay, none; Peru, 34; Uruguay, 200, and Venezuela, 40 long tons.

United States exports of rubber products to South American countries in 1938, divided according to principal groups of products, are given in the following table:

UNITED STATES EXPORTS OF RUBBER PRODUCTS TO SOUTH AMERICA, BY PRINCIPAL GROUPS, 1938—THOUSANDS OF DOLLARS

	Tires	Footwear	Mechanicals	Fabrics	Sundries	Others	Total
Argentina ...	147	6	288	69	116	149	775
Bolivia	46	7	63	6	8	3	133
Brazil	951	6	191	13	75	20	1,256
Chile	315	26	192	20	42	20	615
Colombia	738	32	138	38	79	22	1,047
Ecuador	107	2	21	1	4	1	136
Guianas	5	..	8	..	2	..	15
Paraguay	25	..	2	..	1	..	28
Peru	285	15	71	6	20	5	402
Uruguay	17	1	7	3	5	22	55
Venezuela ...	413	4	194	37	81	16	745
	3,049	99	1,175	193	433	258	5,207

[1] Abstracted from *Rubber News Letter*, Oct. 20, 1939.

Materials Represented as Synthetic Rubber

FOR some time and particularly during recent months many accounts have been published, quite often in newspapers, of discoveries whereby new synthetic rubbers are to be made available. Many times our attempts to get specific information regarding the nature and properties of the product have brought the answers that the process has not been fully developed or that a sufficient quantity has not yet been produced to permit the determination of its characteristics and possible applications.

In view of the apparent tendency to characterize these embryo products as rubber-like materials or synthetic rubber it is of interest to note the following letter received from Dr. McPherson, of the National Bureau of Standards. His letter suggests the following steps for the investigation of materials claimed to be synthetic rubber: (1) identification of inventor's sample; (2) examination of claims for consistency with established scientific facts and principles; (3) independent repetition of the synthesis; and (4) laboratory tests of the independently synthesized material, and service tests of articles made from it.

"EDITOR OF 'INDIA RUBLER WORLD,'
"DEAR SIR:

"EXAMINATION OF MATERIALS CLAIMED TO BE SYNTHETIC RUBBER

"From time to time rubber laboratories are called upon to examine samples of materials claimed to be synthetic rubber, and to pass upon the processes by which the samples are said to have been prepared. Synthetic rubber hoaxes have been numerous in the history of the industry, and any new product for which unusual claims are made is viewed with suspicion by well-informed rubber technologists. On the other hand, the remarkable achievements in the production of materials such as Neoprene, "Thiokol," Vistanex, and the different Bunas engender a reluctance to dismiss any claims, however extraordinary, without a hearing for fear that some radically new discovery may be overlooked.

"The purpose of this letter is to suggest steps which should be taken to determine whether or not a new rubber-like material has actually been synthesized, and if the synthesis has been accomplished, to ascertain its commercial potentialities. The procedure here outlined is intended to dispose quickly of any unfounded claims, and at the same time to establish beyond question the merits of any *bona fide* new development.

"The first step is to examine and identify the sample furnished by the inventor. By no means are all of the products claimed to be new synthetic rubbers either new or synthetic. Sometimes the inventors have simply rediscovered some known material such as plastic sulphur or an organic polysulphide. Many of the samples have borne a striking resemblance to natural rubber. Natural rubber can be identified with a reasonable degree of certainty by determining the kind and amount of non-hydrocarbon constituents such as resins, proteins, and ash. When preliminary tests reveal these constituents in the same proportion as in natural rubber, and when they respond to the same qualitative tests as similar fractions from natural rubber there is little need for investigating the sample further. The claim is sometimes made that the inventor has so precisely duplicated the process by which rubber is formed in nature as to have produced at the same time the accompanying resins, proteins, inorganic salts, etc. Such an achievement is not necessarily impossible, but it is highly improbable.

"Pressure is often brought to bear on the laboratory to make practical compounding and vulcanizing tests on samples furnished by the inventor. Some inventors have prepared large quantities of material and have had a variety of products ranging from bathing caps to tires made up in actual factory runs in order to demonstrate the value of their product. Practical manufacturing tests, however, should not be considered until a later stage in the investigation. If undertaken at the outset they serve only to divert attention from the primary question of the authenticity of the sample. Nothing is to be gained by making elaborate or large-scale tests of camouflaged crude rubber.

"If the preliminary examination of the sample indicates that it has been correctly identified by the inventor, the next step is to ascertain whether or not the synthesis claimed is consistent with known facts and principles of chemistry and physics. Here again the evidence is likely to be of a circumstantial or negative character. Consistency does not constitute proof that the process actually will work, but any glaring inconsistencies may obviate the need for further investigation.

"The value of analyzing the inventor's claims for consistency may be illustrated by reference to the production of rubber from carbohydrates such as starch or sugar. Processes have long been known for making methyl rubber from starch through a number of intermediate steps. If a new process should claim to make rubber from starch in a single step, this claim, though contrary to previous experience, might involve an entirely new type of reaction and might be worth investigating. If, however, it were claimed that rubber had been produced from starch in the proportion of, say, 5 lb. of dry rubber from 7 lb. of starch the claim could at once be branded as impossible because the maximum theoretical yield is only 3½ lb.

"Positive proof that the rubber-like material under consideration has been synthesized can best be obtained by the independent repetition of the synthesis. The laboratory conducting the investigation should independently obtain and identify all raw materials used, and should undertake to conduct the synthesis according to explicit written instructions from the inventor, but without direct assistance from him. In the course of the work it is to be expected that questions may arise and difficulties may be encountered which will call for supplementary information from the inventor. Such information should, of course, be freely furnished, and should be written for clarity and as a matter of record.

"The independent repetition of the synthesis serves two important functions. It is a safeguard against unfounded or fraudulent claims, and it clarifies the description of the process by bringing to light variable factors which may have been overlooked, and procedures which may not have been correctly or adequately described.

"This method is not applicable to secret processes or to processes involving the use of some undisclosed ingredient. Promoters of secret processes are often willing to stage demonstrations of their processes with the use of elaborately sealed containers and other supposed safeguards. Experience has demonstrated, however, that no useful purpose is to be served by witnessing such demonstrations further than to gratify one's interest in the black arts.

"To be sure, not all secret processes that are offered for sale are fraudulent, but the person considering investment in a secret process should realize that his decision must necessarily be based on the integrity and competence of the inventor, rather than on any study of the process itself. Until the inventor is willing to disclose to the investigator the key to his process the investigator is under no obligation to report on the process.

"If it has been demonstrated by test on a small laboratory scale that the material under consideration can be synthesized, a reasonable quantity should then be prepared for test purposes. Vulcanizing or curing procedures should be worked out and tests made of such characteristics as the stress-strain behavior, resistance to abrasion and tear, and stability in the presence of oxygen, chemical reagents, and solvents. These tests will serve as the basis for estimating potential uses of the material for further consideration. A sufficient quantity should then be produced on a larger scale, though still in the laboratory, so that experimental articles may be made up and subjected to service tests.

"Should these service tests be favorable the time is still not ripe for the erection of a factory and large scale production. Two important steps remain, (1) the construction and operation of a pilot plant to work out manufacturing details and to ascertain the probable cost of production, and (2) a market survey to determine whether or not the new product can be produced and sold at a profit in competition with materials already in use.

"To put the whole matter briefly, the potential investor who asks a laboratory to make a few hasty tests of a new 'synthetic rubber' with a view to immediate large scale production should be advised that there are no safe short-cuts to quick profits in chemical manufacture. The ethical chemist must take time to determine, (1) that the product under consideration is genuine, (2) that the method of synthesis is sound and workable, and (3) that the new material can compete in performance or price with either crude rubber or the synthetic, rubber-like materials already available.

"ARCHIBALD T. MCPHERSON,
"National Bureau of Standards."

Potential Crude Rubber Exports under the I.R.R. Agreement—1939 to 1943

ON NOVEMBER 20, 1939, Commodity Exchange, Inc., 81 Broad St., New York, N. Y., released a "Crude Rubber Schedule[1] of Potential Permissible Exports under the International Rubber Regulation Agreement at Various Percentage Levels [50 to 100% inclusive] Which May Be Fixed from Time to Time by the International Rubber Regulation Committee in Relation to the Basic Quotas Established for Each Agreement Territory for the Five Years" 1939 to 1943.

Inasmuch as the permissible quota for the first quarter of 1940 was set on November 15 at 80% and because the upper portion of the schedule is of immediate interest INDIA RUBBER WORLD is reprinting below the figures for each of the five years covering 75, 80, 85, 90, 95, and 100% of total monthly basic quotas for all agreement territories and covering 80, 90, and 100% for each of the individual territories: British Malaya, Netherland India, Ceylon, India, British North Borneo, Burma, Sarawak.

MONTHLY TOTAL FOR ALL AGREEMENT TERRITORIES*

% of Basic Quotas	1939	1940	1941	1942	1943
100	122,042	123,854	124,917	125,583	125,750
95	115,940	117,661	118,671	119,304	119,463
90	109,838	111,469	112,425	113,025	113,175
85	103,736	105,276	106,179	106,746	106,888
80	97,634	99,083	99,934	100,466	100,600
75	91,532	92,891	93,688	94,187	94,313

*Exclusive of Thailand and French Indo-China.

The yearly basic quotas for Thailand follow: 1939, 54,500 long tons; 1940, 55,300 long tons; 1941, 55,700 long tons; 1942, 56,000 long tons; 1943, 60,000 long tons. Exports from that country are subject to the percentages fixed for all territories except that they may not be reduced under 41,000 tons for any one control year.

Exports from French Indo-China are not subject to restriction except that part of any excess over 60,000 tons yearly is to be delivered to the International Rubber Regulation Committee in accordance with Article 6 of the International Agreement.

[1] Unless otherwise indicated, all figures in this schedule represent monthly average permissible exports in long tons.

MONTHLY QUOTAS FOR INDIVIDUAL TERRITORIES

% of Basic Quotas	1939	1940	1941	1942	1943
BRITISH MALAYA					
100	52,667	53,542	54,000	54,250	54,292
90	47,400	48,188	48,600	48,825	48,863
80	42,134	42,834	43,200	43,400	43,434
NETHERLANDS EAST INDIES (TOTAL: ESTATE & NATIVE)					
100	52,625	53,333	53,792	54,167	54,250
90	47,363	48,000	48,413	48,750	48,825
80	42,100	42,666	43,034	43,334	43,400
CEYLON					
100	8,833	8,958	9,083	9,125	9,167
90	7,950	8,062	8,175	8,213	8,250
80	7,066	7,166	7,266	7,300	7,334
INDIA					
100	1,458	1,479	1,479	1,479	1,479
90	1,312	1,331	1,331	1,331	1,331
80	1,166	1,183	1,183	1,183	1,183
BRITISH NORTH BORNEO					
100	1,750	1,750	1,750	1,750	1,750
90	1,575	1,575	1,575	1,575	1,575
80	1,400	1,400	1,400	1,400	1,400
BURMA					
100	1,125	1,146	1,146	1,146	1,146
90	1,013	1,031	1,031	1,031	1,031
80	900	917	917	917	917
SARAWAK					
100	3,583	3,646	3,667	3,667	3,667
90	3,225	3,281	3,300	3,300	3,300
80	2,866	2,917	2,934	2,934	2,934

Agreement territories may *overship* their permissibles by a maximum of *5%* of yearly permissible amounts. Such amounts will be *deducted* from the following year's permissibles. *Undershipments* up to *10%* of yearly permissibles will be added to the following year's permissible amounts. Any territory undershipping by more than 10% will irretrievably lose such excess undershipments.

PAST PERCENTAGES OF BASIC QUOTAS AS FIXED BY THE INTERNATIONAL RUBBER REGULATION COMMITTEE

Year	First Quarter—%	Second Quarter—%	Third Quarter—%	Fourth Quarter—%	Average—%
1935	75	70	65	60	67.50
1936	60	60	65	65	62.50
1937	75	80	90	90	83.75
1938	70	60	45	45	55.00
1939	50	50	60	75	58.75

Solvents in the Rubber Industry—II

Ralph K. Strong[1] and Kenneth Tator[2]

THE following installment concludes the article on solvents in the rubber industry, begun in our December issue.

Vulcanization

There are occasionally in the rubber industry instances where the use of heat to effect vulcanization is undesirable, especially in the manufacture of light colored thin goods where heating would discolor the rubber or adversely affect its physical properties. These products can be vulcanized in the cold with the aid of solvents.

In the Parkes "cold cure" process, sulphur monochloride (S_2Cl_2), used as the vulcanizing agent, is readily absorbed by the rubber, but as it is such a very active vulcanizing agent when used alone, the surface of the rubber is immediately cured, and then the passage of sulphur monochloride into the interior of the rubber is retarded or prevented, resulting in little or no interior cure. For this reason it is customary to dilute the sulphur monochloride with an active solvent or swelling agent for rubber so as to carry the sulphur monochloride uniformly throughout the rubber before appreciable local vulcanization has taken place. Carbon bisulphide is undoubtedly the best solvent for this purpose and in this capacity was used extensively until very recently. Legislation arising from its high toxicity and fire and explosion hazards, have largely eliminated it from commercial use. Its place has been taken by such solvents as carbon tetrachloride, and benzol, or mixtures of these two.

There is another "cold cure" known as the Peachey, or "vapor cure," which in one modification, utilizes solvents. This process is based upon the interaction, within the rubber, of hydrogen sulphide and sulphur dioxide gases. The rubber is dissolved and either of these gases is passed into the solution. The other gas is then dissolved separately in the solvent until saturated, and the two solutions are then mixed, thereby depositing a highly reactive form of sulphur which rapidly effects the cure.

Halogenation

In a manner resembling vulcanization, both in mechanism and to some extent in the nature of its derivatives, rubber can be made to react with halogens. The member of the halogen family most used is chlorine, although bromine, which reacts in a similar manner, has considerable commercial use. In practice these reactions are carried out with the rubber in solution. The halogen or its equivalent is passed into or mixed with the solution at the proper temperature until the reaction has progressed to the desired degree of completeness. Owing to the high chemical reactivity of the halogens it is essential to use a solvent unaffected by halogens such as the completely saturated, chlorinated hydrocarbon, carbon tetrachloride.

Reclaiming

In reclaiming rubber, the process consists, briefly, in removing from the scrap as much of the fillers, fibers, and sulphur as is economically feasible and then converting the residual rubber into a form soft and plastic, thus enabling it to be mixed with and incorporated into crude rubber. For this purpose solvents are commonly employed.

Vulcanization is accompanied by polymerization to such a degree that the effect of solvents is simply to soften and swell the rubber. No satisfactory means have been found to depolymerize vulcanized rubber and still preserve its desirable qualities. In spite of this fact plasticizers may be and frequently are used in rubber reclaiming to soften the vulcanized rubber by swelling and to increase the "tackiness" of the rubber. Pine oil is commonly used for this purpose, since it is relatively non-volatile, and a good swelling agent for vulcanized rubber.

Practical Solvents and Their Applications

As rubber is a hydrocarbon of high molecular weight containing no polar groups, the best solvents for it are also non-polar, or substantially so. For the same reason solvents employed as non-rubber solvents, as in the deresinification of rubber, should be sufficiently polar to render them without effect upon the rubber. Solvents in use by, or of interest to, the rubber industry are now listed.

ACETONE is a rubber non-solvent used for deresinification, and as a coagulating solvent in connection with latex and in the reclaiming of rubber.

BENZOL is a fast evaporating solvent for crude rubber and is much used in the preparation of rubber cement and in the impregnation of fabrics with rubber. Its volatility is too high to permit its satisfactory use in spraying solutions. Owing to the fact that it is usually fractionated to a narrow boiling range, proofing solutions made with it have a tendency to skin-dry on the surface, yielding coatings with a hard, rough surface, having a tendency to curl. It has largely replaced carbon bisulphide as a solvent in sulphur monochloride cures, but the toxicity inherent in benzol, in turn, has caused it to be replaced by petroleum solvents in many applications. Benzol is supplied to the rubber industry in many grades, the more common being: pure, 100% and 90%.

CARBON BISULPHIDE is one of the most active solvents for crude rubber and was formerly used to a large extent as a thinner for sulphur monochloride cures because of its ability to cause penetration of this vulcanizing agent into the rubber before appreciable vulcanization could take place. It is sometimes used as a solvent for the preparation of rubber cement where high volatility is desired. Its use has been effectively discouraged because of legislation against it arising out of its high toxicity, fire and explosive hazards.

CARBON TETRACHLORIDE is a powerful solvent for crude rubber and often employed in the manufacture of rubber cements. It has a distinct advantage over other commonly used rubber solvents in its non-inflammability. An indication of its efficiency in this respect is obtained by its ability to maintain the non-inflammability of cements even when the solvent is composed of two volumes of carbon tetrachloride with one volume of gasoline. The tendency to hydrolyze to form acidic conditions and the toxicity of

[1] Professor of chemical engineering, Rose Polytechnic Institute, Terre Haute, Ind.
[2] Chemical engineer, Egypt, Mass.

its vapors should be recognized. It has been used in mixtures with benzol as a substitute for carbon bisulphide in vapor and cold cures using sulphur monochloride.

CHLORINATED SOLVENTS. As a class, and because of the activity of the more volatile members, the chlorinated solvents may be considered the most active of all solvents for crude rubber. Being non-inflammable, they are used in the manufacture of non-inflammable rubber cements and for modifying the flash point characteristics of inflammable rubber solvents. They show a tendency to hydrolyze to form an acidic condition, which is serious from a corrosion standpoint, and which accelerates the thinning of rubber solutions. In general these solvents have pronounced anaesthetic properties.

CHLOROFORM is one of the best solvents for crude rubber, but its use is confined solely to specialty cements because of its high cost and deleterious physiological effects.

COAL TAR SOLVENTS, as a class, are the most active solvents for rubber of all of the hydrocarbon classes. They are all inflammable, and their toxicity varies almost directly in proportion to the content of benzene in their make-up. The activity of their solvent action for crude rubber decreases in the following order: toluene—benzene—xylene.

CYCLOHEXANOL is a coupling or blending agent with a softening action on rubber which promotes the compatibility of nitro-cellulose and rubber solutions.

CYCLOHEXANONE is a good solvent for crude rubber, cellulose acetate, and cellulose nitrate.

DICHLOROETHYLENE is a non-inflammable solvent for crude rubber. Owing to its unsaturation it is not suitable for vulcanization with sulphur chloride as it will react in part with this material. Development of acidity by hydrolysis demands that it should never be used in contact with strong alkalies. Vapors have a pronounced toxic action.

DICHLOROMETHANE is a non-inflammable solvent for crude rubber and cellulose esters. It develops acidity by hydrolysis and has considerable toxic effect.

DIPENTENE is a solvent for crude rubber and is used as a solvent and swelling agent in reclaiming.

ETHYL ALCOHOL is a powerful resin solvent, but a non-solvent for rubber and is frequently used in the deresinification and purification of rubber, in latex coagulation mixtures, and in small concentrations as viscosity reducing agent for rubber cement.

ETHYLENE DICHLORIDE is a non-inflammable solvent for rubber, yielding solutions which resist thinning with age to an extent greater than does any other chlorinated solvent. It is used in making rubber accelerators.

ETHYL ETHER is a solvent for crude rubber which because of its high anaesthetic effect and high fire and explosion hazard is seldom used alone as solvent. Small amounts are sometimes added to naphtha solvents to secure complete solution. Owing to its solvent powers for sulphur it is sometimes used to remove this ingredient from vulcanized rubber.

GASOLINE is a highly volatile petroleum solvent widely used in the preparation of rubber cements. Its solvent powers for rubber are somewhat inferior to those of the coal tar solvents, but it is free from the toxicity of the latter. In a mixture with alcohol it may be used for coagulating latex.

METHYL ACETATE, a rubber non-solvent, is useful in reducing the viscosity of rubber cements and as a coagulating agent for rubber latex.

METHYL ACETONE is a rubber solvent which has some use as a solvent for latex coagulants.

METHYL ALCOHOL is a rubber non-solvent which in small concentration in rubber cements imparts the greatest reduction in viscosity of all rubber non-solvents.

METHYL CYCLOHEXANONE is a solvent for crude rubber and nitrocellulose and is useful in the blending of these two materials.

NAPHTHAS, PETROLEUM, have a solvent power for crude rubber somewhat inferior to the corresponding coal tar solvents. These naphthas are available in a range of volatilities and are widely used in the preparation of rubber solutions and cements. When used in connection with sulphur monochloride in vapor or cold cures, they should contain a minimum of olefins as these unsaturated compounds consume a portion of the vulcanizing agent. The petroleum naphthas are mixtures of hydrocarbons of various boiling points; this lack of homogeneity favors deposition of desirable films in that, by evaporation, the less volatile portions retard the too rapid drying of the surface and thereby facilitate the removal of the solvent from the interior.

NAPHTHAS, SOLVENT, are coal tar solvents from which practically all the benzol is removed. Supplied in grades of various volatilities, they are widely used as solvents for crude rubber in the preparation of solutions and cements.

NAVAL STORES SOLVENTS in general are seldom used in the rubber industry because of the cost and low volatility; the principal objection to the use, however, is their depolymerizing action upon the rubber.

PETROLEUM SOLVENTS. Refer to Naphthas, Petroleum.

PINE OIL is a good solvent for crude rubber and has some application in rubber reclaiming. When not properly refined it may have a depolymerizing action on rubber.

TERPINEOL is a depolymerizing solvent for crude rubber. Rubber deposited from its solution exhibits evidence of this depolymerization, being quite soft and tacky.

TETRACHLORETHANE, a non-inflammable solvent for crude rubber and sulphur, is limited in its use because of its toxic nature and its tendency to develop corrosive acidity by hydrolysis.

TOLUOL is a better solvent for crude rubber than is benzol and yields more mobile solutions. It is one of the best solvents for chlorinated rubber.

TURPENTINE was formerly used as a commercial solvent for crude rubber, but its use is now discontinued because of its low volatility, its cost, and depolymerizing action upon rubber, but is of academic interest in that its basic chemical structure is closely similar to that of rubber.

TRICHLOROETHYLENE, as a non-inflammable chlorinated solvent for crude rubber, is used in the preparation of rubber solutions, but is not suitable for use with sulphur monochloride because of its chemical unsaturation.

XYLOL is a high boiling solvent for crude rubber of industrial importance. It has been claimed that this material has some depolymerizing effects upon rubber although this statement is open to question.

Guatemala's Big Chicle Crop

From the Department of Peten, where Indians collect chicle from jungle trees, recently came a report of the largest harvest of chicle, the base of chewing gum, ever recorded in Guatemala. The United States imported 2,322,690 pounds, 949,783 pounds more than in the preceding year, and this year's harvest is calculated at 3,000,000 pounds.

Tentative Procedures for Testing the Variability of Normal and Concentrated Latex[1]

THE committee desires to emphasize that these tentative procedures for testing variability are not to be considered as actual specifications for buying or selling latex, since tolerances or limits are not given. Rather, it is the desire of the committee to give what are believed to be reliable methods for the determination of the various properties of latex which have been listed. However, it may be necessary to revise some of these procedures from time to time, since the use of latex is in its infancy and improved methods are being rapidly developed. In listing these procedures the committee does not mean to suggest that it is always necessary to use all of them in testing a sample of latex. In other words, it is up to the users and suppliers to select such methods and tolerances as they see fit, which will best suit their purposes.

The committee desires to express deep appreciation to those who have been instrumental in preparing the attached procedures:

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CRUDE RUBBER COMMITTEE
R. H. GERKE, *Chairman*
E. B. BABCOCK
W. D. PARRISH
G. A. SACKETT
J. C. WALTON

Sampling Latex[2]

1. LATEX IN DRUMS, L-1a. *Outline.* The contents of the drum are thoroughly mixed, and the sample is removed by means of a sample bottle.

Details. In case the sampling operation takes place immediately after the drum is filled, no further mixing is required. In case the drum has stood, the top should be removed and the contents stirred with a high-speed stirrer for 10 minutes.

Attach a 1-liter (32-ounce) open bottle to a 120-cm. (4-foot) length of 0.625-cm. (0.2-inch) steel rod. Introduce the bottle thus attached to the rod into the drum and run it down through the entire body of latex. Withdraw the bottle, discard the contents, refill the bottle, and stopper tightly. This double filling eliminates the possibility of diluting the sample with water which may be present initially in the bottle. It will be found advantageous to leave a small air space in the top of the bottle after the second filling in order to facilitate mixing before weighing out samples.

If closed-head drums are used, a procedure of rolling and upending the drums must be resorted to. Rolling alone is not sufficient. If there is a free air space in the drum, satisfactory mixing can be accomplished within a short time by this means. In case of full drums, transfer all the latex in the closed-head drum to a larger vessel and then take sample according to either of the above procedures.

2. LATEX IN TANK CARS, L-1b. *Outline.* The contents of the car are thoroughly mixed, and a sample is obtained by introducing a 1-liter (1-quart) sample bottle attached to a 300-cm. (10-foot) length of 0.625-cm. (0.25-inch) steel rod.

Details. In case the tank car has been freshly filled, no further mixing will be necessary. If the car has stood, it will be necessary to mix the latex by means of a jet of air from a 1.25-cm. (0.5-inch) pipe inserted through the dome cover of the car and moved continuously throughout the body of the latex. In the case of normal latex this operation should be continued for 15 minutes, and in the case of creamed or centrifuged latex it should be continued for about 45 minutes.

When the contents of the car have been thoroughly mixed, introduce a 1-liter (32-ounce) narrow-mouthed sample bottle attached to a 300-cm. (10-foot) length of steel rod. Withdraw the bottle and empty the contents back into the car. This initial filling minimizes the possibility of errors from moisture which may be in the bottle. Next, force the bottle quickly down through the body of the latex and raise and lower it rapidly through the entire depth of the tank car several times. On account of the narrow mouth, there will be time to do this during the period of filling of the bottle. Withdraw the bottle when it is completely filled. Pour out just enough latex to leave a small air space in the top and stopper tightly.

Determining Total Solids, L-2

OUTLINE. A weighed sample of latex is dried down for a given length of time under specified conditions of temperature. The film is then weighed and the result of the determination is expressed as percentage of total solids based on the whole original latex.

DETAILS. Weigh out 2.5 ± 0.5 gram of latex to be tested into a covered tinned ointment can or small covered dish which has been tared. The latex should be uniformly distributed over the bottom of the dish during drying. The area of the latex should be approximately 32 sq. cm. (5 square inches). Remove the cover and dry the sample in air for 16 hours at 70° C. The percentage of total solids may be calculated by means of the following equation:

$$\text{Percentage of total solids} = \frac{100 \times \text{weight of dried film}}{\text{weight of latex sample}}$$

Determining Dry Rubber Content, L-3

OUTLINE. A weighed sample of latex is coagulated with acid, then washed and dried at an elevated temperature. The result is expressed as percentage of dry rubber content based on the whole original latex.

DETAILS. Weigh out into a porcelain evaporating dish a representative sample of not less than 20 grams of normal latex or 10 grams of concentrated latex and add distilled water until the total solids content is approximately 25%. To this add 2% acetic acid solution with stirring until the latex appears

[1] Report of Crude Rubber Committee, Division of Rubber Chemistry, American Chemical Society, R. H. Gerke, Chairman, United States Rubber Products, Inc., Passaic, N. J. Reprinted from *Ind. Eng. Chem. (Anal. Ed.)*, Nov. 15, 1939, pp. 593-97.

[2] The procedure for sampling latex is given as an example, and may obviously be altered in certain details.

to be coagulated and more acid produces no effect. Place the dish on a steam bath and leave for 0.5-hour. Pour off the serum and replace with distilled water. Remove the coagulum and pass between the tightly closed rolls of a laundry wringer or similar device; then wash again with distilled water and wring out. Repeat this process five times. Dry the resulting crepe to constant weight at 70° C. Calculate the dry rubber content as follows:

$$\text{Dry rubber content} = \frac{\text{weight of dry coagulum} \times 100}{\text{weight of sample}}$$

Determining Coagulum, L-4

OUTLINE. A weighed sample of latex is filtered, and the coagulum remaining on the filter is washed and dried. The result is expressed as percentage of coagulum based on total solids.

DETAILS. A steel pipe union of about 3.75 cm. (1.5-inch) inside diameter is fitted with a one-hole stopper into a suction flask. Between the two parts of the union, a tared circular section of 80-mesh stainless steel screen is inserted so that when the union is screwed together this screen is held firmly in place.

In order to determine coagulum, weigh out 200 grams of latex from a well-stirred sample and dilute with an equal volume of 5% alkali soft soap solution. Sodium or potassium oleates are recommended. Filter this mixture through the 80-mesh sieve in the steel union and wash the coagulum remaining on the filter with 5% soap solution. Finally wash the coagulum free of soap with distilled water. Remove the screen from the union and dry to constant weight at 70° C. The difference in weight of the screen and the weight of the screen plus coagulum held back represents the weight of dried coagulum. Calculate the percentage of coagulum as follows:

$$\text{Percentage of coagulum} = \frac{10{,}000 \times \text{weight of dried coagulum}}{\text{weight of latex sample} \times \text{percentage of total solids}}$$

Determining Methyl Red Titer or Alkalinity

1. LATEX CONTAINING NO FIXED ALKALI OR BASE OTHER THAN AMMONIA, L-5a. *Outline.* The ammonia in a weighed sample of latex is titrated directly with a standard acid solution, using methyl red as an indicator. The result is expressed as percentage of dry ammonia (NH_3) based on the whole original latex. (The precision of this method is affected by the presence of phosphates and proteins in the latex, which may lead to apparent ammonia contents as much as 0.05% too high based on the weight of the sample.)

Details. Pour approximately 10 cc. of the latex into a tared weighing bottle. Immediately cover the bottle. Weigh it to ±0.05 gram. Place 300 cc. of distilled water in a 600-cc. beaker. Uncover the weighing bottle and immediately immerse it in the water in the beaker. Stir the solution thoroughly with a glass rod. Add 6 drops of a 0.1% alcoholic solution of methyl red and titrate with approximately 0.1 *N* standard acid until the indicator becomes pink. The end point occurs before complete coagulation takes place and the color change of the indicator can be detected against the white background of the slightly curdy latex. High results will be obtained if the addition of acid is continued until complete coagulation occurs. The calculation is carried out as follows:

Let w = the weight of the sample of the latex
N = the normality of standard acid
n = the number of cc. of standard acid necessary to neutralize the ammonia

$$\text{Then the percentage of ammonia} = 1.7\,\frac{(N \times n)}{(w)}$$

Precaution. In a direct titration of latex with acid, the acid should not be added so rapidly as to produce local coagulation. Continuous stirring and a moderate rate of addition of the acid are recommended to avoid this.

2. PROCEDURE FOR TOTAL AMMONIA CONTENT, L-5b. *Outline.* The ammonia is distilled from a weighed sample of latex, to which has been added an excess of magnesium oxide, into a measured quantity of standard acid. The excess acid is back-titrated with standard alkali solution.

Details. Weigh out 10 cc. of latex, dilute with water to about 250 cc., and add 4 grams of magnesium oxide. From this mixture distill about 100 cc. into 0.1 *N* sulphuric acid, the amount of the latter exceeding by about 10 cc. the amount used for the determination of the alkalinity. Boil the distillate for 2 minutes and after cooling determine the excess of sulphuric acid by titration with 0.1 *N* alkali, using methyl red as an indicator.

Determining pH in Latex, L-6

It is recommended that anyone about to undertake the making of measurements of pH without having had previous experience in the use of electrometric apparatus should consult Clark's book[3] in order to familiarize himself with the general technique.

OUTLINE. The only suitable means for the accurate determination of pH in latex is the glass electrode.[4] It may be used in conjunction with any one of the various potentiometric arrangements commercially available. In order to make a measurement of pH, the glass electrode is dipped into the solution under test and suitably connected to the reference half-cell and potentiometer. The potentiometer is then balanced, and by equations detailed below the potentiometer reading is converted to pH units.

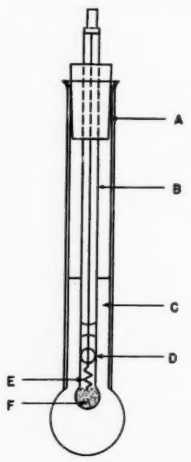


Fig. 1. Glass Electrode Assembly

A. Rubber stopper. B. Inner electrode. C. Hydrochloric acid solution at pH 1. D. Opening for introduction of quinhydrone. E. Platinum electrode. F. Quinhydrone.

DETAILS. *Description and Use of Glass Electrode.* There are two types of auxiliary apparatus which may be satisfactorily used with the glass electrode: (1) a standard battery circuit with a student-type potentiometer and a reflecting galvanometer of sufficient sensitivity; (2) a battery circuit with a vacuum-tube galvanometer. Several instruments of the vacuum-tube type are commercially available, some of which require a separate potentiometer and some of which are completely self-contained. For details of preparation and maintenance of glass electrodes and auxiliary apparatus reference must be made to the pamphlets and circulars describing the various individual types.

An essential part of the glass electrode is always a thin shell blown on the end of a glass tube of specific composition. This shell contains a standard reference electrode, usually of quinhydrone in a solution of unit pH. When an individual shell has

[3] W. M. Clark, "Determination of Hydrogen Ions," Third Ed., Chapters X, XII, XIV, XV, XVI, Baltimore, Williams & Wilkins Co., 1928.

[4] The reasons for restricting the specification to the use of the glass electrode have been discussed in detail by Jordan, Brass, and Roe: *Ind. Eng. Chem. (Anal. Ed.)*, 9, 182 (1937).

once been prepared for use, it must be calibrated with the help of standard buffer solutions, the pH of which has been determined by means of the hydrogen electrode. When the electrode has been calibrated (see below), it is ready for use.

In order to measure the pH of an unknown solution, bring the solution to be tested to a temperature of 25° C. or to the operating temperature which prevails in the control test. (A water thermostat kept at this temperature should be available. The calomel reference electrode and the potassium chloride bridge solution should be suitably immersed in this thermostat.) Insert the glass electrode in the test solution so that the bulb is completely immersed, and make the usual electrical connections, including the introduction of a salt bridge between the test solution and the beaker containing the saturated potassium chloride bridge solution, if a separate calomel electrode is used. Balance the potentiometer with respect to the standard cell in accordance with the directions to be found in[5] or in the pamphlets of directions provided with special forms of apparatus. When this has been done, replace the standard cell by the glass electrode cell and balance the potentiometer against the latter. The potentiometer reading so obtained may be in terms of volts or directly in pH units depending on the type of apparatus employed. If it is obtained in terms of volts, the reading may be converted into pH units by means of the following equation:

$$\mathrm{pH} = A(E - E_0) \qquad (1)$$

where E is the observed potential in volts of the glass electrode-calomel electrode cell as read on the potentiometer, and A and E_0 are constants for a given electrode at constant temperature.

If the reading is directly in terms of pH units, no such conversion is required, but a calibration curve of the individual electrode should always be obtained, and the corrections to scale readings should be utilized in testing unknown samples.

The determination of numerical values for these constants constitutes the calibration of any particular electrode and is described in the next section. When these numerical values are known, pH values may be calculated directly from the potentiometer readings by means of Equation 1.

Calibration of Glass Electrode. Prepare two standard buffer solutions as follows:

1. Add 50 ml. of 1 *N* potassium hydroxide solution to 50 ml. of 2 *N* acetic acid solution and add distilled water to 500 ml.
2. Dissolve 10 grams of anhydrous potassium bicarbonate in water, add 50 ml. of 1 *N* potassium hydroxide solution, and make up with distilled water to 500 ml.

It is essential to use potassium hydroxide rather than sodium hydroxide in preparing these buffers since the glass electrode gives incorrect values in solutions containing sodium ions above a pH of 10. Determine the numerical pH values of solutions 1 and 2 by means of the hydrogen gas electrode in accordance with directions to be found in[6]. (If sodium hydroxide could be used, the hydrogen electrode standardization could be avoided since it is easily possible to obtain carbonate-free sodium hydroxide. However it is much more difficult to obtain carbonate-free potassium hydroxide, and hence the hydrogen electrode standardization cannot be avoided.) When these buffers have been prepared and standardized, the next step is to find the value of the potential of the glass electrode cell when the glass electrode is immersed in each of the standard buffers.

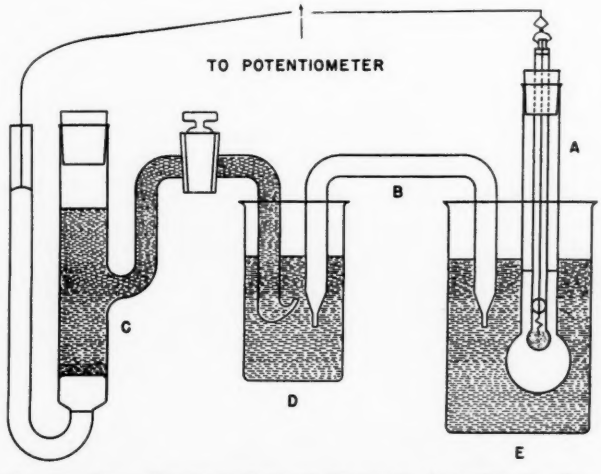


Fig. 2. Glass Electrode-Calomel Electrode Assembly for Use with Apparatus Not Completely Self-Contained

A. Glass electrode. B. Agar agar saturated potassium chloride bridge. C. Saturated calomel electrode. D. Beaker containing saturated potassium chloride solution. E. Beaker containing solution under test.

Let

pH_1 = pH of standard buffer solution 1 as determined by the hydrogen electrode

pH_2 = pH of standard buffer solution 2 as determined by the hydrogen electrode

E_1 = glass electrode potential in standard buffer solution 1

E_2 = glass electrode potential in standard buffer solution 2

Then from Equation 1

$$\mathrm{pH}_1 = A(E_1 - E_0)$$
$$\mathrm{pH}_2 = A(E_2 - E_0) \qquad (2)$$

By solution of the simultaneous system 2 in A and E_0, the following results are obtained:

$$A = \frac{\mathrm{pH}_1 - \mathrm{pH}_2}{E_1 - E_2} \qquad (3a)$$

$$E_0 = \frac{\mathrm{pH}_1(E_1 - E_2)}{\mathrm{pH}_1 - \mathrm{pH}_2} \qquad (3b)$$

If the standard buffer solutions are protected from atmospheric contamination, they will not change in pH appreciably over a period of several months. Hence, the hydrogen electrode standardization need only be repeated at intervals of, say, one month. However, the calibration of the glass electrode should be repeated at frequent intervals; daily, if the glass electrode is in steady use. The aging characteristics of glass electrode shells vary somewhat from shell to shell, and consequently frequent checking of each individual electrode is absolutely essential.

Precautions. On account of the high electrical resistance of the glass electrode and the susceptibility of vacuum-tube galvanometers to external electromagnetic disturbances, special precautions are frequently required to shield the glass electrode outfit from such disturbances.

If a vacuum-tube galvanometer is used, it has been found advisable to place the water thermostat together with the calomel and glass electrode half-cells within a metal jacket which can be completely closed while the potentiometer is being balanced. This metal jacket and the one side of the potentiometer should be grounded, and the electrical connections to the ungrounded side of the potentiometer should be as short as practicable. If an ordinary battery circuit is used in conjunction with the potentiometer, the galvanometer should be protected from stray sources of e. m. f. by grounding one terminal of the galvanometer and shielding it by means of a moisture-proof box. Frequent testing of the glass electrode in the standard buffers will serve as a check on the presence of external disturbances in the electric circuit. A variation of more than 10 millivolts in the glass electrode potential of either of the standard buffers, provided the buffers themselves have not changed (a point which should be checked with the hydrogen electrode), is an indication of difficulties with the electrical system.

The glass electrode fails in solutions of high pH containing sodium ions; hence, it is impossible to determine pH with the glass electrode in latices stabilized with sodium hydroxide.

When the glass electrode is used in latex, it should always be washed free of latex as soon as the determination is finished; otherwise coagulation may take place on the fragile glass membrane. In case a light skin of coagulum does form, it may be removed by rubbing the bulb with a soft wet brush.

(To be concluded)

[5] Clark, *Opus cit.*, Chapter XVI.
[6] *Ibid.*, Chapters X, XIV, and XVI.

EDITORIALS

United States Export Trade in Rubber Goods

DURING recent months the export trade of the United States in rubber goods has increased very appreciably. With the exception of special orders from belligerents presumably as the direct result of hostilities, the increase appears to be quite largely for the purpose of increasing inventories of goods in neutral countries.

According to figures recently compiled by the Leather and Rubber Division of the Department of Commerce, the total exports of rubber goods which averaged $2,797,650 during the first six months of last year, increased in August to $3,218,650, in September to $3,630,650, and in October to $4,155,627, thus indicating a 48.5% rise in volume. Exports to European belligerents rose from a monthly average of $222,892 between January and June, 1939, to $595,510 in August, $611,294 in September, then dropped to $508,240 in October.

Considering a comparison between the October exports and the monthly average for the first six months of 1939, European neutrals including Netherlands, Norway, Sweden, Denmark, and Belgium, increased 51% from $348,000 to $528,000; Latin American countries including Brazil, Cuba, Venezuela, Mexico, Colombia, and Argentina, increased 28% from $722,000 to $925,000; Germany decreased from $33,000 to practically nothing; France decreased from $70,000 to $28,000; and British dominions including Canada, Union of South Africa, Australia, and New Zealand, increased 30% from $475,000 to $617,000.

Early last summer large orders were placed in this country by the United Kingdom for hose as protection against fire loss. Heavy shipments had been made recently against these orders which are now nearing completion. For manufactures other than hose, the exports to the United Kingdom have decreased from an average of $161,606 during the first half of last year to $98,338 in October.

From these statistics there is no evidence that with the exception of hose for fire protection any increase in consumption of rubber products by belligerent nations is to be expected. It is logical that the hose orders will not continue in any such volume as has been recently experienced as the shipments on past orders will be presumed to accommodate largely an initial demand.

While it is possible that British dominions, neutral Europeans, and Latin American countries may require certain continued shipments to replace former imports from belligerent countries, it is reasonable to assume that no such increase as has recently been experienced will continue. A logical assumption is that these countries may have increased their inventories in anticipation of possible interruption in supply. It is quite probable that the question of transportation facilities has had some influence in stimulating the greater export activity. Although the future, of course, is problematical, it appears that ample facilities would still be available for shipments to British dominions and Latin American countries. As these territories constitute the major source of export orders other than special preparedness requirements, a leveling off would appear to be a logical expectation and the result to be a more moderate trade such as would produce a lesser business reaction upon the termination of hostilities. If this assumption is found to be correct, the ultimate effect upon the internal conditions in the United States will be less pronounced and continuation of good business after the war will be possible of realization.

"Modern Pioneers" and the American Patent System

THE program being sponsored by the National Association of Manufacturers to celebrate early this year the founding in 1790 of the American Patent System very fittingly plans to honor prominent American inventors and patentees. Eligible for consideration are those who have made discoveries or inventions upon which the United States Patent Office has, during the last 25 years, issued a patent which has been put into use by industry and through such use has increased employment, provided a new commodity or service, reduced the cost of a product already in use and/or improved quality of a product already in use.

Closely associated in the advancement of American enterprise and standards of living are those who through their ingenuity have perfected new ideas, and the system of governmental registration of those accomplishments, thus creating a basis on which the patentee can claim protection in our courts. Without either, the benefits of or to the other would be nil. Unquestionably the patent system has stimulated the manufacturer and the investor as well as the inventor and has taken an important part in the commercialization of these developments through which the public is enabled to benefit from their application.

For 150 years our patent system has stood as a bulwark on which individual rights have been protected and inventions have been publicized for the information of later inventors. By this program for industrial communities throughout the country to hold "Modern Pioneer" dinners at which local research workers and inventors will be honored, all America will have the opportunity to express its appreciation to those who have produced so that we may enjoy.

S. C. Stillwagon

EDITOR

What the Rubber Chemists Are Doing

A. C. S. ACTIVITIES

A. C. S. Names President-Elect, New Directors and Councilors

THE American Chemical Society recently elected as president for 1941, Dr. Wm. Lloyd Evans, of Ohio State University. Directors named for 1940 to 1942 are: L. H. Adams, Carnegie Institution of Washington; Robert E. Swain, Stanford University; and Elmer K. Bolton, chemical director, E. I. du Pont de Nemours & Co., Inc. Councilors-at-large for 1940 to 1942 follow: Per K. Frolich, Standard Oil Development Co.; Edward Mack, Jr., Battelle Memorial Institute; C. E. Kenneth Mees, Eastman Kodak Co.; and W. Albert Noyes, Jr., University of Rochester.

Rubber Division Committees for 1940

MUCH of the progressive work of the Division of Rubber Chemistry, A. C. S., is in the hands of committees appointed by the division chairman. The achievements of the division along certain lines of endeavor are dependent in a large measure on the men who make up these committees. Supplementing our publication last month of the new membership committee, we now present three other committees as appointed by E. B. Curtis, elected chairman of the division at the fall meeting.

The Crude Rubber Committee for 1940, with the name of an alternate from the same company after the name of each member, follows: chairman, G. Sackett, M. J. DeFrance (Goodyear); E. M. McColm, R. H. Gerke (U. S. Rubber); R. A. Schatzel, G. W. Cassell (General Cable); J. C. Walton, C. C. Davis (Boston Woven Hose); A. H. Nellen, H. Sellers (Lee); W. D. Parrish, R. Au (Goodrich); E. W. Oldham, E. B. Babcock (Firestone).

The Nomenclature Committee for 1940 which continues without change consists of: chairman, H. L. Trumbull (Goodrich); H. L. Fisher (U. S. Industrial Alcohol); S. D. Gehman (Goodyear); J. McGavack (U. S. Rubber); A. W. Sloan (Goodrich); and S. Collier (Johns-Manville).

The committee appointed to promote the nomination of Charles Goodyear for the Hall of Fame at New York University consists of the following: chairman, T. Midgley, Jr. (Ethyl Gasoline); C. L. Parsons (secretary, A. C. S.); H. I. Cramer (division secretary); and H. E. Simmons (University of Akron).

The division treasurer, C. W. Christensen, wishes to purchase copies of the January, 1939, and April, 1939, issues of *Rubber Chemistry and Technology*. He will pay $1 for each copy of these issues received in good condition at his office, 1012 Second National Bldg., Akron, O.

Los Angeles Group Elects Officers for 1940

OFFICERS for 1940 were elected at the December 5 meeting of the Los Angeles Group, Rubber Division, A. C. S., held at the Mayfair Hotel, Los Angeles, Calif. The new officers are: chairman, W. C. Holmes, (Dill Mfg. Co.); vice chairman, B. E. Dougherty, (B. E. Dougherty Co.); secretary, W. C. Reeder, (U. S. Rubber); treasurer, L. F. MacDonald, (Goodyear); directors, C. J. Roese (Goodyear), C. Stentz (Latex Seamless Rubber), F. Woerner (C. P. Hall), and M. L. Paine (Firestone).

At the meeting, Harold Adams, chief of the landing gear division of the Douglas Aircraft Co., discussed the essential differences between airplane and automobile tires; while Gilbert R. Carlock, head of the LaSalle Extension University on the Pacific Coast, in a talk entitled "America First," urged that this country do not become involved in European quarrels.

Lombard Smith & Co., through Mr. Smith, donated the door prize won by Mr. Stentz. The special prize, a radio, donated by D. Hecht & Co., through its representative, Fred Ehrlich, went to E. H. Lewis (Western Insulated Wire). Table favors, mechanical pencils, were given by E. Royal of H. M. Royal, Inc. Monthly meetings of the group will be resumed on the first Tuesday in February.

Extensive Program at Boston Group Meeting

A FULL program, consisting of election of officers, presentation of three papers, a movie, and distribution of gifts, attracted a total of 162 members and guests at the exceptionally large meeting of the Boston Group, Rubber Division, A. C. S., held at the University Club, Boston, Mass., on December 8.

Preceding dinner, Godfrey L. Cabot, Inc.'s, film, "Inside the Flame," on carbon black was shown. Officers for 1940, elected immediately after dinner, are: chairman, J. C. Walton, (Boston Woven Hose); vice chairman, H. S. Liddick, (Davidson Rubber); secretary-treasurer, D. D. Wright (Hood Rubber); executive committee, H. P. Fuller, (Pequanoc) and L. R. Clarke (Haartz-Mason-Grower).

The three prize-winning papers[1] of the recent New York Group Essay Contest, which won such wide acclaim at their earlier presentation in New York, were presented by their respective authors: G. R. Vila, (Naugatuck Chemical); and W. M. Widenor and W. B. Dunlap, Jr., (both of Lee Tire & Rubber). Two of these papers were on the T-50 test which stimulated considerable interest in a T-50 test apparatus displayed before the group by the Henry L. Scott Co.

Door prizes distributed at the close of the meeting were provided through the generosity of the following concerns: Cabot; Continental Carbon Co.; E. I. du Pont de Nemours & Co., Inc.; Wm. D. Egleston Co.; C. P. Hall Co.; Krebs Pigment & Color Co.; Monsanto Chemical Co.; New Jersey Zinc Co.; Pequanoc Rubber Co.; *The Rubber Age*; Scott; United Carbon Co.; and L. G. Whittemore, Inc. Several additional prizes were supplied by the Boston Group itself.

A report read by Mr. Walton pointed out that the group has a total paid-up membership of 149 and has $205.80 in its treasury. New by-laws were voted on and accepted by the group.

N. Y. Group's Christmas Party Attended by 430

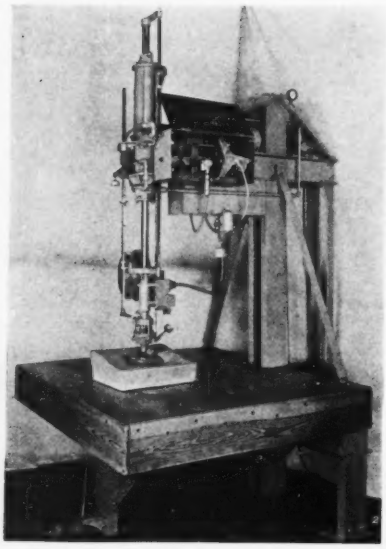
AN OVERFLOW crowd of 430 members and guests attended the annual Christmas Party of the New York Group, Rubber Division, A. C. S., on December 15, at the Building Trades Employers' Association, 2 Park Ave., New York, N. Y. Officers for the ensuing year were elected as follows: chairman, C. R. Haynes, Binney & Smith Co.; vice chairman, K. J. Soule, Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.; secretary-treasurer, P. P. Pinto, *The Rubber Age*; sergeant-at-arms, J. H. Carroll, R. E. Carroll, Inc.; executive committee (three-year term), M. R. Buffington, Lea Fabrics, Inc., W. F. Tuley, Naugatuck Chemical Division of United States Rubber Co., and D. A. Shirk, Rare Metal Products Co.; executive committee (two-year term), W. H. Grote, United Carbon Co.

Following dinner, the entire evening was given over to entertainment and the distribution of gifts. The approximately 200 fine presents awarded to fortunate ticket holders were made available through the generosity of the following concerns: Admiar Rubber Co., Akron Standard Mold Co., American Zinc Sales Co., Anaconda Sales Co., Binney & Smith, Godfrey L. Cabot, Inc., Carter Bell Mfg. Co., Continental Carbon Co., E. I. du Pont de Nemours

(*Continued on page* 70)

[1] These three papers were printed in full in INDIA RUBBER WORLD, Nov. 1, 1939, pp. 34-38, 41-46, and 47-48.

New Machines and Appliances



Scott Latex Sponge Cushion Tester

Foamed Latex Sponge Tester

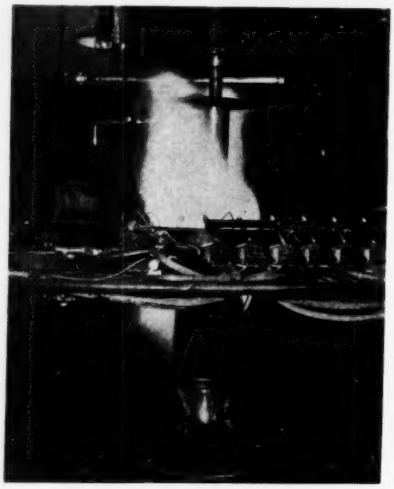
PRODUCTION testing of foamed latex sponge cushions or mattresses, ranging in thickness of from ½-inch to 18 inches, is accomplished on a newly developed machine which compresses the sample between a hydraulic-ram-driven pressure measuring head and a flat table. Control is automatic throughout the entire working cycle, and to start the tester in operation merely requires the depression of a single foot treadle. Resetting is accomplished by unlatching this foot control. Adaptable for production line requirements, the machine will test two or three units per minute.

Pressure for the hydraulic ram, which is placed in operation by the foot-manipulated latch, is furnished by a self-contained motor-driven pump and oil reservoir. The speed of the ram before contacting the cushion is controlled at approximately 100 inches per minute. After contact, the closed-circuit pressure measuring head, mounted upon the lower end of the ram, records the resistance exerted by the cushion upon a circular pivoted pressure foot of 50 square inches area. At ½-pound load upon the cushion, an automatic speed regulator becomes engaged, reducing the ram speed to 25 inches per minute. At this speed the ram further compresses the specimen to a predetermined percentage of the total cushion thickness. The machine automatically stops at this point, and the total pressure required for compression is read on a dial indicator. If desired, means for recording this value could be installed.

The working area of the table is five feet long and four feet wide, and the framing of the machine has been so designed that installation in a conveyer system for continuous flow operation is possible. Weighing 1,400 pounds, the tester is said to be rugged in construction, quiet running, safe operating, and inexpensive to maintain. With the cooperation of the Foamed Latex Sponge Rubber Committee of The Rubber Manufacturers' Association, Inc., the machine was developed by the Henry L. Scott Co., Providence, R. I.

New Flame-Hardening Process for Rolls and Mandrels

A HIGH degree of hardness in steel and alloy iron rolls, mandrels, etc., is being obtained by a new flame-hardening process, known as the "vertical combination method." Through this



Roll Being Flame-Hardened by Vertical Combination Method

process the hardness of a 65-70 carbon steel cylindrical object can be raised to approximately 90 or better as measured on the Type C scleroscope. In tests on a special dry sand alloy cast iron, known as Farreflame, an average hardness of 80 has been obtained.

The new method is continuous, uses a large number of flame tips, and is followed immediately by a water spray quench. Thus overlap from the flame, characteristic of the old progressive method, is eliminated, and all rolls that have been flame-hardened by the "vertical combination method" have shown no evidence of measurable distortion, it is claimed. Among the many applications of the new process are the following: rubber engraving rolls, embossing rolls, calender rolls under certain conditions, different types of mandrels that encounter excessive pressure or wear, rolling mills, and dough machines. The process, developed by Linde Air Products Co., is now in operation at the plant of Farrel-Birmingham Co., Inc., Ansonia, Conn.

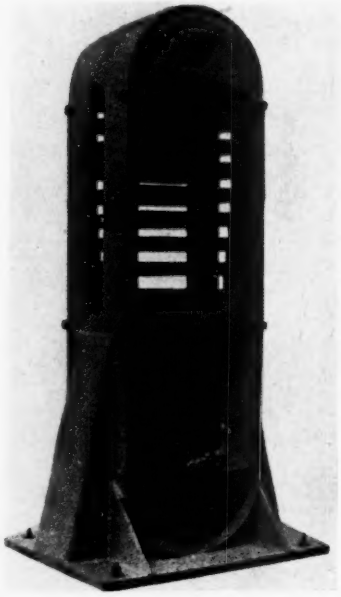
Self-Locking Nuts

ELASTIC stop nuts are of the self-locking type and incorporate a resilient collar of vulcanized cotton cellulose which takes up all thread play, thus establishing a constant thread contact which holds the nut in position on the bolt regardless of vibration or wear of surrounding parts. The nuts are made in any metal and in any style, size, and thread system desired. Elastic Stop Nut Corp.

Ring-Type Presses

IN THE full-ring-type hydraulic press (illustrated) a frame of rolled steel plate is used as the only tension element; no bolts or nuts are required in tension. The upright frame is joined by a reenforced weld, either at the top or bottom, and the base is welded to the frame. The full-ring-type press is designed for total pressures of 500 tons or more.

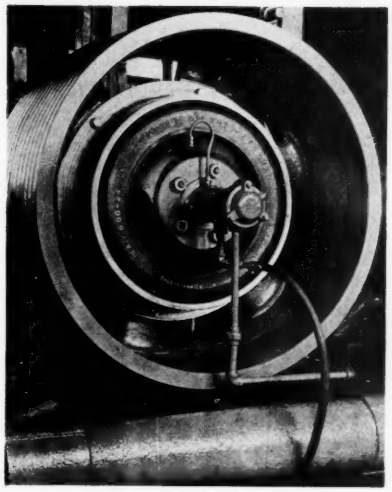
In the semi-ring-type press, designed for tonnages of from 250 to 450, the frame consists of one piece of rolled steel, curved at the top and joined at the bottom by a suitable cross member. Both presses are built in a variety of forms and with any desired number of openings to cover a wide range of press requirements. Stewart Bolling & Co., Inc., Cleveland, O.



A 500-Ton, 24- by 24-Inch, Eight-Deck, Full Ring Press

New Goods and Specialties

Structural View of Clutch Tire



Airflex Clutch in an Oil Well Rig

Rubber-Tired Industrial Clutch

THE Airflex rubber clutch comprises essentially a pneumatic tire within a suitable clutch band. The clutch tire consists of a heat-resisting rubber tread, several plies of tire fabric, and a tube which is coated on the inside to resist oil fumes that may accumulate in the compressor line. The rubber tread is fluted, presenting a squeegee action that minimizes slippage. Adhesion is obtained through a friction liner, which is contacted by the clutch tire upon its expansion.

Advantages for the rubber clutch over the conventional plate clutches are said to be many. It is lighter in weight and has only three or four parts as compared with many times that number of pieces in the conventional clutch. Because of the flexibility in the application of its pressure, the Airflex clutch provides uniform pressure on every inch of surface and, for this same reason, can take care of a reasonable amount of angularity and misalinement. The capacity of the Airflex clutch is regulated by internal pressure and can be changed to conform to needs.

Airflex clutches are being developed for industrial purposes, such as machine tools, conveyers, and Diesel electric generators, as well as applications in the marine engine and oil well fields. The Fawick General Co. has been organized to manufacture the new Airflex clutch and will be affiliated with The General Tire & Rubber Co., Akron, O.

Air Hose to Avoid Glass Breaks

RUBBER hose is slit open and snapped over the edges of glass plates to permit handling without breakage, reported a Buffalo, N. Y., tannery to The B. F. Goodrich Co., Akron, O. The glass is used in a special leather finishing process in which leather is put face to face with the glass and carried in a vertical position through a drying converter system, resulting in a superior finish on the leather.

Diathermy Pad Electrodes

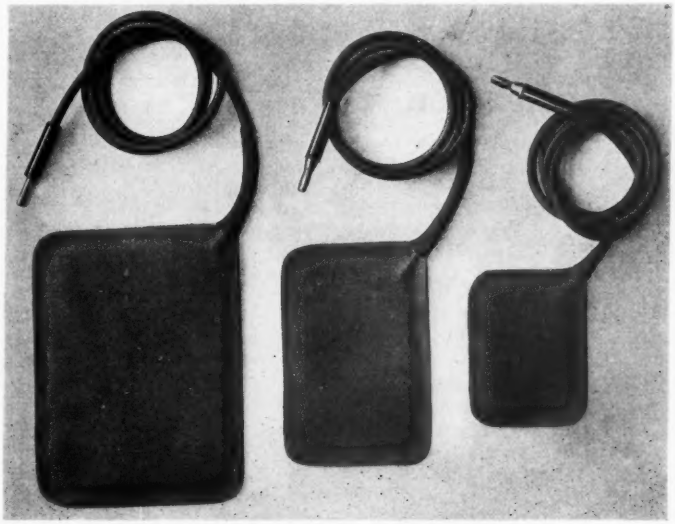
BECAUSE of its excellent dielectric properties, rubber is used for the pad electrodes of a diathermy apparatus which relieves pain in such conditions as arthritis and neuritis. The electrodes comprise two sheets of pure gum rubber stock between which is placed a thin square sheet of brass, somewhat shorter and narrower than the rubber sheets. The latter are firmly vulcanized to the surface of the brass plate and to each other at the electrode edges. Before vulcanization the surface of the brass sheet is specially treated to inhibit copper deterioration of the rubber. A rubber insulated wire which is connected to the brass plate has a plug for connection to the apparatus.

The electrical apparatus consists of a high-frequency generator which produces a 14-meter radio wave. This high-frequency energy is applied to the person's body by means of the pad electrodes, passing through the rubber and then through the body tissue. The tissue with poor dielectric properties becomes heated, while the rubber remains cool because of its good dielectric properties. By dilating the blood vessels, this deep seated heating stimulates circulation, thus relieving pressure against nerve fibers to alleviate pain. In the construction of the generator it was found that hard rubber, because of its high dielectric coefficient and ease of machining, was desirable for electrical spacing in the high frequency fields. Home Diathermy Co., Inc.

G. & J. Tire and Tube

A NEW truck tire, known as the Stalwart Delivery and designed particularly for "stop-and-go" driving, has a wide, flat, deep tread, enabling the tire to resist frictional loss, with special ribs to provide quiet running, easy steering, and smooth riding.

A new two-color, full-molded inner tube, made of heat-resistant rubber compound, has a laminated base and is reenforced with a special, rust-resistant pinch-proof rubber compound. The G. & J. Tire Division of United States Rubber Co., New York, N. Y.



Rubber Diathermy Pads

UNITED STATES

Production Rates Settle at More Logical Levels as the Business Rush Subsides

Although industrial orders were not so heavy recently as in previous months, plants, many of which have been operating close to capacity, are still busy filling orders received during the rush period, and this activity should continue well into the first quarter of 1940. Production, however, continues greater than demand; so corrective adjustments are inevitable. Inventories have risen, yet not so high as anticipated. Unemployment, although it remains one of the nation's gravest problems, has been declining, and in certain industries skilled workers are still needed; but, in general, most factories now have all the help required. It is expected that industrial production in 1940 will be higher than in 1939, although definite predictions are not ventured because of the situation in Europe and the coming presidential election.

The settlement of labor dispute in the automobile industry has sent back to work not only auto employes, but those in related industries, including rubber. Automobile output last month rose more than seasonally and was expected to reach the high figure of December, 1936. Many companies have not yet caught up with retail orders although new orders are lagging. Oil and power output also gained last month. Machine tool operations in November were the highest for the year; while the manufacture of leather shoes for 1939 was expected to hit a new high with about 419,500,000 pairs.

Tin plate operations rose to 98% of capacity early in December, but later declined to 88%. Freight loadings eased slightly, but were higher than a year ago. Lumber output and cotton mill operations fluctuated mildly, with cotton sales spurting. At the end of November steel ingot production went to 94.4%, the highest since 1929, and then dropped to 90% last month, creating an opportunity for renovations after three months of hectic operations. The drop in output was not so great as originally feared because of the backlog and moderate volume of new business. However, steel shipments last month continued at record levels. It is expected that by the end of January production will be more closely geared to actual consumption.

Business in the rubber industry is at a generally satisfactory level though there is a tendency toward a slight leveling off in some lines. Crude rubber consumption in November is estimated at 54,322 long tons in comparison with 55,764 long tons in October, but the November rate is 10.7% over November a year ago. The value of rubber goods exported in the first ten months of 1939 almost equaled that for the entire year of 1937, the best of recent years, and 1939 should be the highest since 1930. Because of holiday shutdowns the production of rubber goods for December will show a reduction over October and November, but inventories can safely accommodate requirements. It is expected that good business will continue in January.

CALENDAR

Jan. 12.	Society of Chemical Industry. Perkin Medal Award. Chemists' Club, 52 E. 41st St., New York.
Jan. 15-19.	Society of Automotive Engineers. Annual Meeting. Book-Cadillac Hotel, Detroit.
Feb. 6.	Los Angeles Rubber Group. Mayfair Hotel.
Feb. 27.	National Modern Pioneers Dinner. 150th Anniversary of Founding of American Patent System. Waldorf-Astoria Hotel, New York.
Mar. 4-8.	American Society for Testing Materials. Committee Week. (Spring Meeting, Mar. 6). Statler Hotel, Detroit.
Apr. 8-12.	American Chemical Society. Spring Meeting. Cincinnati. Division of Rubber Chemistry. April 11 and 12. Hotel Gibson.
May 13-15.	American Institute of Chemical Engineers. Statler Hotel, Buffalo.

EASTERN AND SOUTHERN

U. S. Rubber Negotiates Purchase of Fisk

Subject to the approval of the stockholders of the Fisk Rubber Corp., Chicopee Falls, Mass., who were scheduled to meet on December 29, a sales agreement was signed on December 9 by executives of the United States Rubber Co., New York, N. Y., and Fisk Rubber Corp., whereby U. S. Rubber would purchase all properties and business of the Fisk Rubber Corp. The agreement stated that if majority votes of the preferred and common stockholders of Fisk could not be obtained on or before January 27, 1940, the agreement might be cancelled by either party. If approved on December 29, transfer was to take place in 1939.

Under the agreement the price to be paid by U. S. Rubber to Fisk in addition to assuming certain detailed liabilities of Fisk is $6,827,330.25 plus 109,981 shares of U. S. Rubber common stock plus accrued dividend on the Fisk preferred stock from December 31, 1939, to date of redemption or through retirement not later than 32 days after the transfer.

It is estimated that after deducting fees and other expenses to be borne by Fisk and after providing for the retirement of the 33,675 shares outstanding on December 9, 1939, (plus 400 shares owned by subsidiary) of Fisk preferred stock at $110 per share and accrued dividend there still remains for distribution approximately $6.75 cash and ¼ of a share of U. S. Rubber common stock for each share of Fisk common stock. On December 9, 1939, the closing price of U. S. Rubber common on the New York Stock Exchange was $41 per share or at the rate of $10.25 for ¼ of a share. At this quotation holders of Fisk common stock would receive for each share of Fisk common approximately $17 in cash and market value of U. S. Rubber common. Scrip certificates will be distributed for fractional shares.

When the Fisk directors voted tentative acceptance of the U. S. Rubber offer, Col. Charles E. Speaks, director and president, and Karl H. Behr, director, refrained from voting. If the sale is completed Colonel Speaks is to receive a termination allowance. Mr. Behr is also a vice president of Dillon, Read & Co., which firm upon completion of the transfer is to be paid for its services in negotiating the contract.

The agreement provides that if the proposed sale is made a termination allowance of $176,400 is to be paid to seven of the executives of Fisk who will not become associated with U. S. Rubber, but who will hold themselves in readiness for a period of three years to give advisory service to U. S. Rubber on request, but not to such extent as to prevent their taking other employment. These termination allowances include: $100,000 for Colonel Speaks and the balance of $76,400 to be divided in varying amounts among Rolland C. Guy, treasurer; W. H. Benton, auditor; George E. Whitelam, vice president; D. J. Brightman, H. R. Hurd, and A. D. Phillips. With the exception of the above named men the buyer intends to take into its employ all persons now employes and officers of the seller and to give to them the benefits of the employes welfare and compensation plans of the buyer on the same basis as though they had been employed by the buyer during the period that they were employed by the seller, although the buyer does not undertake any binding obligations.

According to balance sheets as at October 31, 1939, there is no outstanding funded debt for Fisk, and the capital stock consists of 33,875 shares of 6%

cumulative preferred stock, par value $100 per share, callable at $110 per share and accrued dividends, and 439,923 shares of common stock, par value $1 per share. Corresponding statistics for U. S. Rubber include: First mortgage and collateral trust 3⅝% bonds, series "A", due July 1, 1958 (less $956,000 held by Insurance Fund Trustees of U. S. Rubber), $42,044,000, and first mortgage 5% bonds of Gillette Rubber Co., due January 1, 1955 (less $800,000 held by Insurance Fund Trustees of U. S. Rubber), $100,000; 8% non-cumulative preferred stock, par value $100 per share, non-callable, 651,091 shares; and common stock, par value $10 per share, 1,576,261 shares.

During the 10 months ended October 31, 1939, Fisk showed net sales of $15,326,961.64 and a net income after taxes of $934,090.11. On October 31, 1939, the Fisk total assets were $14,637,988.02. During the 10 months ended October 31, 1939, U. S. Rubber showed net sales of $162,200,052.48 and net income of $8,679,558.24. On October 31, 1939, the U. S. Rubber total assets were $178,678,785.66.

U. S. Rubber has stated in the agreement that it wishes to buy the Fisk properties and business with the intention of operating the Fisk plants at Chicopee Falls and New Bedford at increased capacity for the production of tires to be sold both under trade names now used by Fisk through Fisk's dealer organization and also under trade names used by U. S. Rubber. U. S. Rubber, however, assumes no legal obligation to operate the plants. With the exception of the seven executives referred to previously, U. S. Rubber has advised of no other changes in personnel in taking over the business.

At the meeting on December 29 in Wilmington, Del., the Fisk stockholders voted approval of the sales agreement. Final tabulation showed 24,056 preferred shares and 280,617 common shares in favor of the sale and 28 preferred and 58,560 common shares opposed to the sale.

Speaks on Safety

Ernest W. Beck, safety director, U. S. Rubber, on December 19, addressed a foremen's meeting of the Blackstone Valley Safety Council in the Community Centre at Manville, R. I., on "Forty Thousand Reasons for Talking Safety." The program included entertainment and refreshments.

To Move N. Y. Headquarters

U. S. Rubber is selling the 20-story structure at 1790 Broadway, New York, which it has occupied for the past 27 years, to move into the last building, now under construction, in Rockefeller Center. This 20-story edifice, at 48th St. and Sixth Ave., will be known as The United States Rubber Co. Bldg. The eleven upper floors, which comprise 60% of the building, will be occupied by the principal executive and management offices of the company. The leasing agreement runs

Architect's Drawing of New Home of U. S. Rubber

for more than a decade, and the new building, which will have all the latest improvements in office building construction including air conditioning, is expected to be completed in March when the United States Rubber Co. will move in.

Providence Plant Toured

About 50 members of the national sales organization of The Warner Brothers Co., Inc., manufacturer of corsets, brassieres, etc., Bridgeport, Conn., visited Providence on December 11 for a first-hand inspection of the local plant of U. S. Rubber, which makes the rubber product used by Warner.

To Represent Naugatuck in New England

Harold P. Morris last month assumed the duties of New England representative for Naugatuck Chemical Division of U. S. Rubber for latex, Lotols, and Dispersite, with headquarters at 560 Atlantic Ave., Boston, Mass. Before joining Naugatuck recently, Mr. Morris spent seven years at the Akron plant and two at the Fall River plant of the Firestone Tire & Rubber Co. He is a graduate of Gettysburg College and Akron University, where he held a fellowship in 1930.

Tire Dealers Corp. Activities

U. S. Tire Dealers Corp., 1790 Broadway, is distributing to its dealers a one-reel motion picture, "For Safety's Sake," that utilizes a 30-foot high model to emphasize the important construction and operating features and advantages of the new U. S. Royal DeLuxe tire.

H. N. Hawkes, vice president and general sales manager of U. S. Tire Dealers Corp., recently announced the appointment of Roy W. Collings as head of the newly created business development department. His successor as manager of the automobile tire department is F. M. Stewart, for the past few years advertising and sales promotion manager. Charles J. Durban, previously engaged in special tire merchandising and promotional work, was appointed manager of the tire advertising and sales promotion department.

"Modern Pioneers" To Be Honored in Conjunction with American Patent System Sesquicentennial

The National Association of Manufacturers, 14 W. 49th St., New York, N. Y., is sponsoring a celebration, to culminate with a banquet on February 27 at the Waldorf Astoria Hotel, New York, commemorating the 150th anniversary of the founding of the American Patent System. In conjunction with this event the N.A.M. has launched a search for the nation's most outstanding inventors and scientists who have secured patents on their machines, processes, etc., within the last 25 years —those who have contributed most to the creation of new jobs, new industries, new goods and services, and a higher standard of living—to be known as "Modern Pioneers."

Manufacturers, trade groups, and scientific societies were asked to name living candidates, and nominations closed last month. A special committee of 80 leading industrialists was appointed by the N.A.M. to promote the search. Included in this group are: W. B. Bell, president, American Cyanamid Co., New York; F. B. Davis, Jr., president, United States Rubber Co., New York; Lammot du Pont, president, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.; Harvey S. Firestone, Jr., vice president, Firestone Tire & Rubber Co., Akron, O.; H. W. Prentis, Jr., president, Armstrong Cork Co., Lancaster, Pa.; Edgar M. Queeny, president, Monsanto Chemical Co., St. Louis, Mo.; S. B. Robertson, former president, The B. F. Goodrich Co., Akron; Joseph Rossman, patent attorney, Rothschild, Wis.; Charles E. Speaks, president, Fisk Rubber Corp., Chicopee Falls, Mass.; and Howard I. Young, president, American Zinc, Lead & Smelting Co., St. Louis. Six eminent scientists: chairman, Karl T. Compton, Massachusetts Institute of Technology; Forest R. Moulton, American Association for Advancement of Science; George B. Pegram, Columbia University; John T. Tate, University of Minnesota; Edward R. Weidlein, Mellon Institute; and Frank C. Whitmore, Pennsylvania State College, were named to select America's outstanding "Modern Pioneers" upon whom special honors will be conferred at the dinner next month.

Preceding the national program on February 27, industrial communities throughout the nation will honor in local celebrations their own "Modern Pioneers."

Research in Industry Survey

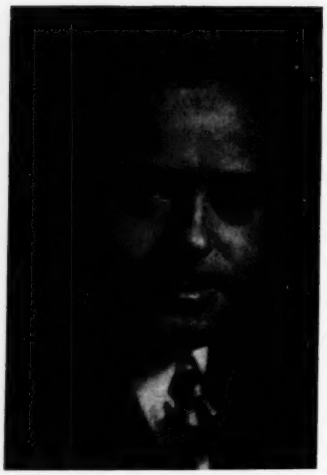
National Research Council, 29 W. 39th St., New York, N. Y., through Chairman Ross G. Harrison has announced the appointment of Raymond Stevens, vice president of Arthur D. Little, Inc., Cambridge, Mass., as director of a nation-wide survey of research in industry, initial plans of which were formulated early last month at the first meeting of a special committee held in New York. While funds for the work had been made available by the National Resources Planning Board, of which Frederic A. Delano is chairman, the survey will be conducted and the report prepared by the National Research Council, in accordance with plans approved by an advisory committee of leading scientists, industrial research directors, and executives. The report, to be submitted in printed form by the council this year, will present an objective study of industrial research as a national resource, as a means of aiding in its further development and utilization.

Mr. Stevens has obtained a leave of absence from Arthur D. Little, Inc., which will permit him to devote most of his time to the survey, headquarters of which will be in the National Research Council Bldg., Washington, D. C.

The National Research Council, a cooperative organization of scientific men, includes representatives of engineering and industry. Membership is composed largely of the accredited representatives of about eighty-five national scientific and technical societies. The council was established in 1916 at the request of President Woodrow Wilson, by the National Academy of Sciences to coordinate the research facilities of the country for work on war problems involving scientific knowledge.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., according to A. W. Robertson, chairman of the board, is experiencing excellent business; all plants are busy, most of them on full time. Incoming orders are holding up well, continuing the improvement that extended throughout most of 1939. Orders booked for the first ten months totaled $176,896,557, against $125,323,348 for the corresponding period of 1938. The company's backlog of unfilled orders is approximately $66,000,000, compared with a backlog of $40,188,150 on December 31, 1938.

Tingley-Reliance Rubber Corp., manufacturer of molded rubber goods, 903 Ross St., Rahway, N. J., a few weeks ago experienced a fire in its machine shop, but, fortunately, no part of the main plant where direct production is engaged in was injured. Already Tingley-Reliance has rebuilt the burned building and installed some of the equipment that was damaged as well as new equipment.



Blank & Stoller

Dr. I. Drogin

Drogin Joins United Carbon

Dr. Isaac Drogin has joined United Carbon Co., Inc., as director of research, with headquarters at Charleston, W. Va., where the company maintains its executive offices and research laboratories. For almost eighteen years he was with J. M. Huber, Inc., New York, for many years directing carbon black production and later serving as chief chemist.

He was born in Bialystok, Poland, December 10, 1891, and came to this country in 1901. He holds a B.A. degree from the College of the City of New York and the M.Sc. and Ph.D. degrees from the University of Pittsburgh and was a Fellow in Research at The Mellon Institute, Pittsburgh, Pa., from 1914 to 1921. Dr. Drogin has written much on carbon black and has spoken before many groups. He also belongs to the American Chemical Society, The American Institute of Chemists, The Chemist's Club (N. Y.), and The New York Academy of Sciences.

Dr. and Mrs. Drogin will live in Charleston.

The Thermoid Co., Trenton, N. J., has purchased an adjoining plot of ground from the Pennsylvania Railroad, to be used for future expansion. The Thermoid office force and other employes recently held a Christmas party at the Geneva Tavern; about 125 persons attended. Fred E. Schluter, president of the company, has been named to the committee of five New Jersey industrial leaders of the National Association of Manufacturers to formulate "Industry's Platform for 1940" and will represent the New Jersey rubber industry.

Crescent Insulated Wire & Cable Co., Trenton, N. J., continues to operate 24 hours a day with prospects of a good winter season. Company officials report a general increase in prices of some goods.

Congress of American Industry

Congress of American Industry, sponsored by the National Association of Manufacturers, 14 W. 49th St., New York, N. Y., was held at the Waldorf-Astoria Hotel, New York, December 6 to 8. The three-day session, attended by more than 2,500 industrial leaders, discussed the country's chief economic problems under the general slogan "Forward with the Republic." A program to restore prosperity on the basis of free enterprise and reasonable government regulation was adopted as well as a report condemning pump priming as a failure and demanding economy in government expenditures. A "Platform of American Industry," advanced by the congress, gave 28 specific points for the expansion of the nation's economy through cooperation of industry, labor, the inventor, and the consumer and had for its object the best method for the managers of industry to serve "the enlightened interests of industry itself by serving the interests of the nation as a whole."

One of the two executives who presented the platform was Col. Charles E. Speaks, president, Fisk Rubber Corp., Chicopee Falls, Mass. Others who addressed the gathering included F. N. Bard, president, Barco Mfg. Co., Chicago, Ill.; Wm. D. Anderson, Bibb Mfg. Co., Macon, Ga.; and Paul Garrett, director of public relations, General Motors Corp., Detroit, Mich.

H. W. Prentis, Jr., president, Armstrong Cork Co., Lancaster, Pa., was elected head of the N.A.M., and Edgar M. Queeny, president, Monsanto Chemical Co., St. Louis, Mo., was elected a vice president; while Lammot du Pont, president, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., was named a regional vice president for 1940.

Toyad Corp. recently was formed at Latrobe, Pa., with 70 employes to manufacture displays, toys, and novelties of latex and latex sponge. Officers include W. M. Gardner, president; J. R. Rogers, secretary-treasurer; and G. R. Hecht, general manager. Lyle A. Clough, who recently resigned from the research and new products division of the Goodyear Tire & Rubber Co., Akron, O., is chief chemist of the new company.

John A. Roebling's Sons Co., cable manufacturer, Trenton, N. J., has moved its New York, N. Y., office to 19 Rector St.

The Engineering Foundation, a research organization of the national engineering societies, 29 W. 39th St., New York, N. Y., last month elected as chairman to succeed the late Prof. George E. Beggs, Dr. Oliver E. Buckley, a pioneer in the development of high-speed submarine telegraph cables, who is also executive vice president of Bell Telephone Laboratories, 463 West St., New York.

Over 40,000 See Chemical Show

The Seventeenth Exposition of Chemical Industries, held at Grand Central Palace, New York, N. Y., December 4 to 9, was viewed by more than 40,000 registered visitors. As evidenced by the interest of the visitors and in the opinion of the 336 exhibitors, this year's exposition, again under the direction of C. F. Roth, was the most successful ever held. The American Chemical Society's exhibit again struck a keynote when it presented its aggregation of industrial research products under the slogan — "Chemistry Catalyzes Commerce." In this exhibit rubber research was pictured in a composite photo-mural. Porous rubber filter media, products of Filter Media Corp., were displayed here; while visitors had the opportunity to examine Nylon and Vinyon stockings.

Although much of the equipment on display was applicable to rubber manufacturing operations, actual rubber processing machinery was not prominently featured. Of direct interest to rubber manufacturers were platen presses, laboratory mixers, and a water-cooled rubber grinder; for latex work, ball and pebble mills, colloid mills, centrifugals, and various types of stirring and mixing equipment. A wrapping machine for packaging materials in Pliofilm or cellophane was on display, as were also a heat sealer for Pliofilm and an electrical heating tank for Korogel. Supplementary equipment used in rubber manufacture included: driers, materials handling equipment, packaging machines, safety devices, dust collecting systems, fire extinguishing equipment, weighing apparatus, and electrical equipment. Twenty-four exhibitors showed instruments of precision for indicating, recording, and controlling—temperature, pressure, humidity, turbidity, pH, etc.

Among the organic chemicals presented were di-ethyl amines, used as rubber accelerators and recently placed in large-scale production in this country. Before the current war they were largely imported from Germany. Also displayed were diatomaceous products, used as rubber fillers. Casein for use with latex and as an adhesive for rayon to rubber in tire manufacture and flexible cement consisting of latex and casein were also shown.

The increasing usage of rubber in chemical processing equipment was noted at this year's show. The Luzerne Rubber Co. and American Hard Rubber Co. featured rubber tank linings as well as hard rubber pipes and fittings, rubber-covered fan blades, and all-hard-rubber pumps. Other companies showing rubber products included: the Garlock Packing Co. and the Johns Manville Co.—packing; Great Western Mfg. Co. —adhesives; Mine Safety Appliances Co.—molded rubber safety products; Maurice A. Knight—all-rubber shipping drums; U. S. Stoneware Co.—pipe joints and tank linings. Neoprene gloves and aprons were displayed by the Pioneer Rubber Co. Chlorinated rubber was shown by Hercules Powder Co., and chlorinated rubber paint was exhibited by the Harrington Paint Co.

On December 5, H. L. Fisher, U. S. Industrial Alcohol Co., Stamford, Conn., gave an address on "The Modern Rubber Industry" before 150 students taking part in the exposition's course, discussing the size of the industry, supply of crude rubber, production of rubber goods, and compounding and testing practices. The special applications of latex, the reclaiming of rubber, and the different types of synthetic rubbers were also discussed.

Continental Carbon Co., 295 Madison Ave., New York, N. Y., has announced the promotions of C. E. McKinney and C. J. Minnig to the positions of vice president in charge of operations and vice president in charge of sales, respectively. Both officers have been with the company since it was founded. Mr. McKinney, formerly superintendent of carbon black operations, will continue his headquarters at the plant at Sunray, Tex.; while Mr. Minnig, formerly sales manager, is at the company's Akron, O., office.

Mercer Rubber Co., Hamilton Square, N. J., continues to operate normally. President William H. Sayen has been on an extended business trip through the West.

Report on Engineering Education

The Engineers' Council for Professional Development recently issued a report on "Present Status and Trends of Engineering Education in the United States" by Dr. D. C. Jackson. The general theme of this report, a product of the task of accrediting curricula in engineering, is that the engineering school, for years a stepchild of the university, has fought its way upward and stands today on the level of the university and, in some cases, even on a higher level.

According to this report, of the 135 engineering schools acted upon by the ECPD up to October 22, 1938, there were a total of 3,832 persons in the teaching staffs of the engineering departments in the years between 1933 and 1936. These schools reported a capital investment for buildings and equipment of $137,835,000 apportioned to engineering and an annual income allotted to engineering of $23,870,000. The foregoing investment was $2,060 per student, and the income for engineering was $358 per student per year, including full- and part-time students.

The National Association of Cotton Manufacturers this year awarded its medal for student achievement to Opal Hill, a technical assistant in the engineering department of Wellington Sears Co., 65 Worth St., New York, N. Y., where the presentation was made on December 7 by Russell T Fisher, president of the association.

Mrs. Juanita Youngs, wife of Arthur M. Youngs, president of Youngs Rubber Corp. of Trenton, New Jersey, died November 24 after a brief illness. She is survived by her husband and three sons. Burial was in Greenwood Cemetery, Trenton.

Jos. Stokes Rubber Co., Trenton, N. J., has advanced Lloyd R. Leaver, of its sales staff, to the position of general manager of the plant at Welland, Ont., Canada. Mr. Leaver, with Stokes nearly 18 years, was one time associated with the Hamilton Rubber Mfg. Co., Trenton.

THE J. H. DAY CO. THE BRISTOL CO. TAYLOR INSTRUMENT COS. CAMBRIDGE INSTRUMENT CO., Inc.

J. H. Day Co.'s Exhibit: Laboratory Kneading and Mixing Machines, Ro-Ball Gyrating Screen, Gearless Pony Mixer, Sifter and Mixer for Powders and Pastes, and Laboratory Three-Roll Paint Mill; Bristol Co.'s Exhibit: Full-Size Coordinated Process Control Panel, Flow Meter, Pneumatic Telemeter, Multiple-Point Wide-Strip Potentiometer, Pyromaster Controller, Radiation Pyrometer, Electronic Controller, and pH Recorder and Controller; Taylor Instrument Cos.' Exhibit: Temperature Recorders and Controllers, Time-Temperature Controllers, and Indicating Thermometers; Cambridge Instrument Co., Inc.'s, Exhibit: Surface Temperature Pyrometers, Recorders and Indicators for pH, CO_2, and O_2, and Exhaust Gas Analyzers

Du Pont Begins Nylon Production at Seaford, Del., Plant

Manufacture of Nylon yarn in the first unit of the new plant in Seaford, Del., began on December 15, it was announced by E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. The first step of the Nylon process is performed in the du Pont plant at Belle, W. Va., which makes Nylon "intermediates" for the Seaford plant. In the latter plant Nylon flakes are produced and then transformed, by melting, spinning, twisting, and stretching, into Nylon yarn. The plant also produces Nylon polymer, some of which will be made into brush bristles, surgical sutures, and other articles by the du Pont plastics plant at Arlington, N. J.

The Seaford plant, when in complete operation, will employ approximately 850 workers and will produce about 4,000,000 pounds of Nylon yarn yearly. One of the most promising uses for the yarn is in hosiery. Other textile applications, such as knit goods, underwear, and woven dress goods, are the subjects of experimentation.

Refunding of du Pont's Debenture Stock

At a special meeting on September 29 holders of preferred stock—$4.50 cumulative and of common stock of E. I. du Pont de Nemours & Co. approved an amendment of the certificate of incorporation (a) increasing the number of shares of preferred which the company shall have authority to issue, from 500,000 to 3,000,000 shares, and (b) increasing the redemption price of such shares from $115 a share and accumulated dividends thereon to $120 a share and accumulated dividends. The reasons for this amendment were (1) to enable the directors to offer to holders of debenture stock shares of preferred stock in exchange for shares of debenture stock then outstanding, and (2) to make available shares of preferred stock which the company shall have authority to issue in the event they are required for corporate purposes in the future.

On October 9 holders of the debenture stock were offered 1⅛ shares of preferred stock in exchange for each share of debenture stock outstanding. Under the offer, which expired at the close of business October 24, about 97% of the debenture shares were exchanged.

Pursuant to action of the directors on November 20, all debenture shares remaining issued and outstanding on January 25, 1940, will be redeemed on that date at $125 a share and accumulated dividends thereon, the redemption price to be paid in cash upon surrender of the debenture stock certificates. Such redemption will require approximately $4,500,000.

Pocono Co., Trenton, N. J., finds business dropped off a little after a busy five months. Company officials expect a pickup during the winter.

A.S.M.E. Symposium on Rubber and Plastics

At the sixtieth annual meeting of The American Society of Mechanical Engineers held in Philadelphia, Pa., from December 4 to 8 the Rubber and Plastics Subdivision presented a symposium on December 6 at which one paper on rubber and two on plastics dealt with engineering data on these materials. The lengthy discussions of these papers indicated the keen interest in and desire for information of this nature. Special meetings were held by the Educational Committee and the Research Committee of the Rubber and Plastics Subdivision which respectively discussed ways and means for acquainting mechanical and design engineers with the properties of these materials and the procurement of data needed for the proper and larger incorporation of rubber and plastics into structural usage.

The United States Labor Department, Washington, D. C., in its lists of recently awarded government supply contracts included the following: Navy: *cable:* Habirshaw Cable & Wire Division, Phelps Dodge Copper Products Corp., New York, $134,204; *hose:* Union Rubber & Asbestos Co., Trenton, N. J., $23,899, United States Rubber Co., New York, $36,458; *life preservers:* New York Rubber Corp., New York, $23,430; *matting:* The B. F. Goodrich Co., Akron, O., $11,854; *pigment:* Titanium Pigment Corp., New York, $24,295; *wire and cable:* Anaconda Wire & Cable Co., New York, N. Y., $49,655; Procurement: *cable:* Garfield Electrical Supply Co., Inc., New York, indefinite amount; *hose:* Mercer Rubber Co. of New York, Inc., New York, indefinite amount; War: *cable:* General Cable Corp., New York, $159,140, Okonite Co., Passaic, N. J., $174,400; *cutting of teeth:* Farrel-Birmingham Co., Inc., Buffalo, N. Y., $15,580.

John R. Bleasdale was elected president of the Vulcanized Rubber Co. Local Union at a meeting at Morrisville, Pa.

Essex Rubber Co., Trenton, N. J., reports conditions very satisfactory for the season, with indications of a good winter trade.

Pierce-Roberts Rubber Co., Trenton, N. J., busy for the past five months, dropped one of its three shifts after production slowed up last month.

The Rubber Manufacturers' Association of New Jersey held its annual meeting in December at the Trenton Club, Trenton, N. J. The following officers were reelected, following a dinner: A. Boyd Cornell, Hamilton Rubber Mfg. Co., president; Lloyd R. Leaver, Jos. Stokes Rubber Co., vice president; Charles E. Stokes, Jr., Home Rubber Co., secretary; and Horace B. Tobin, formerly with Woven Steel Hose & Rubber Co., treasurer.

Dispersing Agent for Aqueous Systems

"Hornkem," developed particularly for latex work, is a 35% aqueous solution derived by special processes from a natural, sulphonated compound of unknown molecular structure. It is said to be capable of dispersing to a high degree a great number of different pigments in an aqueous medium and to possess, besides, certain unusual characteristics.[1]

The new dispersing agent is slightly acid, but can be modified so as to be neutral or alkaline. It is stable and effective in both acid and alkaline solutions. "Hornkem" is claimed to be adaptable to both dry and wet grinding.

There are two types of "Hornkem": one (No. 3) is a combination wetting-dispersing agent for pigments of highly water repellent character; the other type (No. 1) is purely a dispersing agent, and, as it does not have the properties of a wetting agent, it does not appreciably affect the surface tension of water. The latter type is preferable where foaming is undesirable or where wetting does not constitute a special problem.

[1] For description of the peculiar phenomena exhibited by "Hornkem" see pp. 33-37.

Whitehead Bros. Rubber Co., Trenton, N. J., reports production continues good.

Nearpara Rubber Co., Trenton, N. J., experienced slackening demand for reclaimed rubber.

PACIFIC COAST

D & M Expands with Better Trade

D & M Machine Works, manufacturer of pistons and universal rods, Torrance, Calif., according to Factory Manager W. E. Shawger, has been compelled to make a number of expansions throughout the plant owing to increased business in oilfields, and all departments are operating 16 hours a day to keep up with orders on hand. The firm has added two new engines to its generating plant to supply more current for the foundry. A new 150 h.p. boiler has replaced the old 100 h.p. one; the new boiler is in a better location near the power plant, and the exhaust from the gas engines heats the water to boiling point before going into the boiler. Besides one new steam engine and hydraulic pump have been added. Piston business, moreover, has increased to the extent that it has become necessary to make four more 24-inch presses to accommodate orders. The presses are designed and built by D & M, which expects to add six more in the near future because of the manufacturing of a special line of mechanical goods.

OHIO

"Rubber Ball" Attracts 4,000

Akron's second annual "Rubber Ball," sponsored by the Women's Art League, was held on December 2 in the city's armory, attended by 4,000. Leonard K. Firestone, executive of the Firestone Tire & Rubber Co. and one of the five sons of the late founder, all with the company, was king of the ball; while Miss Mary Gertrude Seiberling, granddaughter of F. A. Seiberling, founder and chairman of the board of The Seiberling Rubber Co. and dean of the rubber industry, was queen. Both Their Majesties were recipients of rubber crowns.

Most of the brilliant and colorful costumes adhered to the general theme of depicting the basic factors in rubber —earth, air, water, and fire—and the contributing fields of chemistry, transportation, and the machine, and many prizes were awarded to individuals and groups. Among the costumes were "Rubber on the Farm," a gathering of farmers, farmerettes, and barnyard fowl and animals; Stalin, Hitler, Chamberlain, and Death; Statue of Liberty and Uncle Sam; a man sitting on "Top of the World;" "Machinery;" "Fire;" "2 in 1" Twin Tire; airplanes; peasants; pirates; historical costumes; soldiers; bathing "beauties;" skiers; and strictly formal evening attire. Materials used in their fabrication included mechanical rubber goods; tires; elastic yarn; rayon cord for tires; Pliofilm; Controlastic rubber fabric; Koroseal, Koroseal treated silk, and Koroseal treated marquisette (Ko-ro-web).

Among the guests were Mr. and Mrs. John W. Thomas, Firestone president; Russell A. Firestone and his mother, Mrs. Harvey S. Firestone, Sr.; J. E. Trainer, also of Firestone; F. A. Seiberling; Nils Florman, president, National Rubber Machinery Co.; Mr. and Mrs. R. S. Wilson, vice president and sales manager, The Goodyear Tire & Rubber Co.; W. E. Fouse, vice president, The General Tire & Rubber Co.; John Pflueger, of Enterprise Mfg. Co.; and the following from The B. F. Goodrich Rubber Co., J. J. Newman, vice president in charge of tire sales, Wm. Bechler, assistant comptroller, Mr. and Mrs. L. H. Chenoweth, merchandising manager of the mechanicals division, Mr. and Mrs. M. D. Maskrey, product manager, mechanicals division, and Miss Helen Wright, Goodrich designer and creator of every one of the growns which were prize winners in the professional group.

The King (L. Firestone) and the Queen (M. G. Seiberling) of the "Rubber Ball"

"Rubber on the Farm," Winner of First Prize for Group Costumes, Flanked by J. W. Thomas (Left) and R. A. Firestone (Right)

The Goodyear Tire & Rubber Co., Akron, recently completed an order for 44½ miles of woven single-jacket fire hose ordered by the British Government to supplement existing fire fighting equipment in the British Isles essential in air raid decontamination and fire protection.

On January 2, 1924, Goodyear installed an experimental 10- by 12-foot section of rubber block paving in front of the trucking entrance to the factory. Technical examination by company engineers last month showed that, despite heavy traffic, the rubber blocks had experienced but slight wear and looked fit for another 16 years of service. The rubber blocks or bricks, each eight inches long, four inches wide, and four inches high, and with tongue and groove construction on their sides, were laid on a quarter-inch cushion of high-melting-point asphalt superimposed upon an eight-inch concrete base. One end and one side of each brick was painted with an asphalt emulsion.

Mark L. Felber, veteran newspaper editor now with the Goodyear public relations department for more than a decade, is the author of the recently released "Felber's Tavern," a story built around a tavern run by his grandfather in the 1880's.

The Firestone Tire & Rubber Co., Akron, recently received a federal contract for $328,329 as one of two "educational" orders to train manufacturers to make gas masks. Johnson & Johnson, New Brunswick, N. J., received the other ($347,714).

The Ohio Rubber Co., manufacturer of automotive, molded, and extruded rubber products, Willoughby, according to President Franklin G. Smith, is erecting a new addition to its plant, to cost about $100,000, which will be used chiefly for shipping and warehousing and will release needed space in other buildings for manufacturing. The new one-story building, of brick and steel, sawtooth construction, 90 by 340 feet, scheduled for completion on February 1, will have a ten-truck loading dock fully enclosed and a dock for carload shipments extending the length of the building.

Seiberling Rubber Co., Akron, through President J. Penfield Seiberling, reported that its fiscal year ended October 31, 1939, was unusually prosperous, with its profits more than triple those of the preceding year and sales at a new ten-year high. The Seiberling Rubber Co. of Canada, Ltd., and companies in England and France also reported a very satisfying year. Mr. Seiberling believes future prospects of the company are very bright.

Mr. and Mrs. R. S. Wilson Attired in Attractive Costumes Which Were Fashioned of Rayon Cord and Miniature Tires

"Miss V-Belt," a Prize Winner in a Gown That was Made of Koroseal and V-Belts

"Winter" and "Summer" Embraced by General's New "2 in 1" Twin-Season Tire between "Machinery," with W. E. Fouse at the Left

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Goodrich Staff Changes

The B. F. Goodrich Co., Akron, through C. B. O'Connor, general sales manager of the tire division, has announced the appointment of Guy Gundaker, Jr., with the company since 1924 and manager of the automotive acces-

sory division since its creation in 1935, as special representative to R. McTammany, assistant general sales manager of the tire division. Mr. Gundaker's successor is E. R. Bell, manager of the accessories sales department.

W. C. Bray, manager of the truck and bus tire department, recently reported several personnel changes. J. T. Staker, formerly in the mileage contracts division, has been made manager of the fleet sales division of the truck and bus tire department. H. G. Couturier, of the Goodrich district staff at Milwaukee, has been named western manager of the fleet sales division and will assist the Chicago, Kansas City, Milwaukee, Minneapolis, Omaha, and St. Louis districts on fleet sales. The activities of J. R. Rutherford, eastern manager of the fleet sales division with headquarters in New York, N. Y., have been expanded to aid and supervise fleet sales in Boston, Albany, New York, Philadelphia, Washington, Charlotte, and Atlanta districts. Assisting Mr. Rutherford will be R. E. Montgomery, transferred from the company's purchasing department after he had secured a varied background in tire production.

G. L. Mathias, general superintendent of the mechanical goods division, has announced the promotion of Frank Vogelsang to process engineer of the division and of B. A. Evans to production manager of Dept. 8,000, mechanical molds.

P. L. Dildine, manager of factory standards, was elected president of the Northern Ohio Chapter of the Society for Advancement of Management at a recent meeting in Cleveland.

New Koroseal Paint and Primer

A new Koroseal paint, designated as No. 495 Korolac, and a Korolac primer for use with the new paint have recently been introduced. The paint gives a semi-glossy finish which is said to withstand all acids, alkalies, and salts in common industrial concentrations, with temperatures up to 150° F. Other properties of the firm are said to include resistance to atmospheric conditions, moisture, and abrasion. Applied to metal surfaces, the primer forms a strong bond between the Korolac and the metal. Both primer and paint can be applied by either brushing or spraying.

Vulcalock Cements Now on Sale

Formerly sold only under license agreements, the Goodrich line of Vulcalock cements recently was released for sale on a restricted basis. Not rubber, but solutions of Thermoprene, a patented thermoplastic made by chemical alteration of rubber, the cements, when dried, form tough, horny films. They are translucent, amber liquids of light engine oil consistency, effective in bonding rubber to metal and joining numerous other materials including many synthetic resins, woods, and ceramics.

According to the manufacturer, the strength of bond ranges from 10 to 500 pounds per square inch, depending upon the method of application and the materials joined. The cements resist cracking by bending, shock, or variations in temperature, have chemical resistance better than rubber itself, and do not absorb moisture or swell in water.

Tubes Resist Puncture in Fair Demonstrations

At the Goodrich New York World's Fair exhibit cars equipped with Goodrich Lifesaver tires and Seal-o-matic tubes were driven six times a day, nine times on Saturdays and Sundays, over a platform bristling with sharp railroad spikes without a single tire or tube failure. The tubes, made with a layer of self-sealing composition on the inner side and used in the demonstrations during the fair, are said to have withstood a total of nearly 4,000 punctures without loss of air pressure, and in some instances single tubes were punctured more than 100 times. The demonstrations were witnessed by 5,335,912 spectators.

C. G. Kiess

Ian D. Patterson

2,667 in Twenty Year Service Club

Membership of the Goodrich Twenty Year Service Club now totals 2,667, following the recent eleventh semi-annual pin presentation ceremonial, when President John L. Collyer gave special remembrances to Peter Seiler and Dave Suloff, who have been with the company a half century, and also presented nine employes with 40-year service pins, 39 with 30-year service pins, and 215 with 20-year service awards. In addition 37 others in the field had already received their emblems.

Kiess Joins National Rubber

National Rubber Machinery Co., Akron, O., has announced the appointment of C. G. Kiess as manager of its wire division. After completing engineering studies Mr. Kiess worked 18 months in the test department of General Electric Co., going from there to Westinghouse Electric & Mfg. Co., South Philadelphia Works, where he served four years on central station and marine engineering work. His next 13 years were spent as plant engineer and maintenance superintendent of Williamsport Wire Rope Co. (now Bethlehem Steel Co.), where he engaged in the design of wire rope and wire mill equipment. Mr. Kiess later became president and chief engineer of Industrial Inhibitors, Inc., and as such designed and built the Wire Rope Plant of Jones & Laughlin Steel Corp., Muncy, Pa.

General Superintendent

Ian David Patterson, recently appointed superintendent of St. Mary's Mfg. Co., subsidiary of the Goodyear Tire & Rubber Co., manufacturing molded rubber products and Pliofilm at St. Mary's, O., is well qualified for such an important position by training, experience, and native ability. Born in Eckford, Mich., April 6, 1897, he attended Albion High School and Albion College (A.B., 1919), then the University of Michigan (B.Sc.E., 1920).

He served as chemical engineer at Edgewood Arsenal, Edgewood, Md., in 1920. The next year he joined Goodyear in Akron as chemical engineer and tire compounder. Then, in 1927, he was transferred to Goodyear Tyre & Rubber Co., Wolverhampton, England, as chief chemist, becoming development manager in 1936. Early in 1939, Mr. Patterson was brought back to Akron for special work.

He belongs to the American Institute of Chemical Engineers, the American Chemical Society, the Institution of the Rubber Industry (British), and Sigma Nu. His hobbies are golf and tennis.

He is married and has nine-year-old twin daughters. The family home is at 136 Edgerton Rd., Akron.

LEGAL

Retreader Liable for Defects

The Supreme Court of California, in a decision last month, held that a retreader of automobile tires is liable for injuries resulting from defects in its products and affirmed judgments of $8,500 to three persons for injuries received in 1936 when a retreaded automobile tire blew out as the car was going 60 miles an hour on an open desert highway. The District Court of Appeals, First District, ruled, in this case, Nebelung vs. Norman, 97 (392) C. A. D. 304, that driving at that speed under the circumstances was not negligence as a matter of law.

Under the Supreme Court opinion the Appellate Court decision as well as the judgment of Trial Judge Raymond McIntosh of the Superior Court of Sierra County was upheld.

The District Court of Appeals in its opinion declared there was ample evidence to sustain the plaintiff's contention that as an approximate result of disintegration the retread of the tire became completely detached from the casing, causing the car to swerve out of control and overturn off the road.

Edward Nebelung, Jr., and John Mucia were awarded $500 each, and John Virnig $7,500 against the Laher Springs & Tire Co., Los Angeles, Calif.

The action of the Supreme Court in the case had been awaited with interest in view of the far-reaching significance of Judge McIntosh's ruling and that of the Appellate Court. In affirming Judge McIntosh, Justice Homer R. Spence of the First District Court of Appeals in his opinion said in part:

"In this action for damages for personal injuries sustained by plaintiff when his automobile went out of control as a retread tire on the automobile disintegrated, there was sufficient evidence that the proximate cause of the accident was caused by negligent construction of the retread tire, where defendant manufacturer, in retreading the tire failed to remove the breaker strips from the tire before applying the new tread and failed to take proper precautions to avoid a mold pinch in applying the new tread and thereby causing the new tread to loosen and separate from the casing, as a result of which plaintiff lost control of his auto while driving down the highway."

Baldwin Rubber Wins Appeal

The Court of Appeals in Cincinnati has reversed a decision by Judge Ernest A. O'Brien, of Detroit, in Case No. 8124, Baldwin Rubber Co., Pontiac, Mich., vs. Paine & Williams Co., Cleveland, O., wherein Baldwin Rubber Co. had appealed from a judgment of $101,491.54 in favor of Paine & Williams Co. for royalties alleged to be due on making auto floor coverings and method of and apparatus for them.

NEW ENGLAND

R. I. Industrial Activity

According to recent statistics, on industrial activities in Rhode Island, eight rubber manufacturers reported 4,025 employes during October, against 3,791 in September and 3,685 in October, 1938. In November the payroll total of the rubber interests increased to $339,011, 3.9% more than in October and 17% more than in November, 1938. Payrolls for October, 1939, totaled $326,000, against $286,000 for September and $253,000 for October, 1938. In October, 1939, 3,178,000 kilowatt hours of electric power were used, against 2,693,000 kilowatt hours in September and 2,079,000 in October, 1938. Sharp man-hour gains were also reported; six rubber establishments reported 170,483 during October, 10.7% over September and 13.3% over October, 1938.

Washburn Wire Works, East Providence, R. I., is erecting a 22- by 41-foot concrete and metal building for lockers, washrooms, and showers for employes, at its Bourne Ave. plant, to cost about $2,500.

Kinnecott Wire & Cable Co., Inc., is erecting a 20- by 82-foot connecting structure of steel and brick between buildings Nos. 14 and 18 at its plant in Phillipsdale, East Providence, R. I., to cost approximately $10,000.

The Black Rock Mfg. Co., rubber cutting machine specialists and manufacturers of light rubber machinery, Bridgeport, Conn., according to President Guy L. Hammond, recently held a stockholders' meeting at which Joseph R. Keller was made a director and general manager of the company. D. H. Aker has joined the organization to assist in sales and advertising.

MIDWEST

Armour Institute of Technology, Chicago, Ill., in cooperation with several universities and technical societies, is again sponsoring the annual Midwest Power Conference to be held in the Palmer House Hotel, Chicago, April 9 and 10, under the direction of Stanton E. Winston, associate professor of mechanical engineering at the institute. Charles A. Nash, associate professor of electrical engineering, is secretary of the 1940 conference. The purpose of the Power Conference has been established as that of offering an opportunity for all persons interested in power production, transmission, or consumption to meet together annually to study mutual problems free from the restrictions of required memberships in

(*Continued on page* 66)

OBITUARY

S. Theodore Hodgman

S. THEODORE HODGMAN, of the family identified with the rubber industry for nearly a century, died in a New York hospital on November 26 from a paralytic stroke. He was born in Yonkers, N. Y., December 26, 1871, and attended Berkeley School and Columbia University. Then he entered the Hodgman Rubber Co. at Tuckahoe, later becoming a director and secretary-treasurer; he retired in 1924. In 1926 he joined the Archer Rubber Co., Milford, Mass., in charge of its New York branch. The deceased was also a member of the Society of Ninth Company Veterans of the Seventh Regiment and of Seventh Regiment, N. Y. N. G.

Survivors include his wife, a son, two daughters, and a brother.

Funeral services were conducted at Christ Church, New York, on November 28, with interment in Kensico Cemetery.

F. S. Schimerka

FRANCIS SERAPH SCHIMERKA, since 1921 chemist for Thomas A. Edison, Inc., West Orange, N. J., who assisted the inventor during his experiments on synthetic rubber, died at his home in East Orange on December 18 following a brief illness. Born in Vienna, 66 years ago, the deceased was educated at the Polytechnicum there. Before joining Edison, Mr. Schimerka worked for several copper concerns in the United States, Mexico, and Russia. His last two years were spent helping compile data on Mr. Edison's work.

Sheldon F. Payne

SHELDON F. PAYNE, for a number of years plant engineer at Goodyear's Metallic Rubber Shoe Co., Naugatuck, Conn., died on December 7 at his home in Naugatuck. Mr. Payne, who lived to be 97 years of age, was the last surviving Civil War veteran in the Naugatuck and Waterbury district. In 1883 he entered the employ of the Goodyear's Metallic Rubber Shoe Co., which later became a subsidiary of the United States Rubber Co. Mr. Payne, who had been very active into his late nineties, was prominent in church and local affairs. He is survived by a son, Walter P. Payne, who has been associated with the engineering department of U. S. Rubber for many years.

CRUDE IMPORTS INTO ARGENTINA IN the first nine months of 1939 decreased as compared with the corresponding period of 1938; the respective figures were 6,725,405 kilos against 7,775,790 kilos. Most of this rubber came from British territories.

FINANCIAL

Unless otherwise stated, the results of operations of the following companies are after deductions for operating expenses, normal federal income taxes, depreciation, and other charges, but before provision for federal surtax on undistributed earnings. Most of the figures are subject to final adjustments.

Collins & Aikman Corp., New York, N. Y., and subsidiaries. Nine months ended November 25, 1939: net profit, $1,416,440 after depreciation, federal and state income taxes, and other charges, equal to $2.23 each on 562,800 shares of common stock after preferred dividend requirements, contrasted with net profit of $369,651, or 34¢ a common share in the same period of 1938.

Dayton Rubber Mfg. Co., Dayton, O. Year ended October 31: sales, $9,150,000; net profit, $780,000 after taxes and all charges, equal to about $3.85 a share on 176,670 outstanding common shares after allowing for dividend requirements on the Class A preference stock, contrasted with net profit of $472,548, or $2.15 each on 176,839 common shares then outstanding in the corresponding period of the previous fiscal year.

Firestone Tire & Rubber Co., Akron, O. Year ended October 31, 1939: after providing for all expenses including $7,146,535 for depreciation, $12,958,000 for direct taxes, and $1,650,000 for adjustment of current assets in foreign countries to prevailing rates of exchange, net income, $6,722,045, equal to $2.03 a common share, against $5,258,041, or $1.27 a common share, for the preceding fiscal year; total current assets, including $13,853,127 cash, $89,564,381, against $84,750,403 total assets, including $18,942,956; current liabilities, $15,113,823, against $9,429,497; net sales, (the largest on record), $160,119,022, against $141,882,681.

New Jersey Zinc Co., 160 Front St., New York, N. Y. Quarter ended September 30, 1939: net profit, $1,460,290 after federal income taxes, depreciation, depletion, etc., equal to 74¢ a share on common, against $798,246, or 40¢ for the quarter ended September 30, 1938, and $971,382, or 49¢ for the quarter ended June 30, 1939; nine months ended September 30, 1939, net profit, $3,507,939, or $1.78 a share, against $2,185,104 for the same period of 1938.

Seiberling Rubber Co., Akron, O. Year ended October 31, 1939: net profits, $828,791.74, against $297,494 in the preceding fiscal year; gross sales, $10,896,543.09, a 14.04% increase; consolidated surplus account, $1,709,382, a gain of $1,064,869.03; net worth of the company, $4,007,294.25, a rise of $1,578,924.14; cash on hand, $524,859.54; current assets, $3,361,479.53, and current liabilities, $1,155,698.56, a ratio of 2.9 to 1.

Statistics of Income of the U. S. Rubber Manufacturing Industry for 1937[1]

According to "Statistics of Income for 1937," released by the Bureau of Internal Revenue, the rubber manufacturing industry of the United States in 1937 enjoyed a gross income of $1,106,954,000, the largest since 1929, making the fifth successive year that gross income has increased. Of the 643 tax returns received, 320 were from corporations reporting net incomes, 294 from corporations reporting no net incomes, and 29 from inactive corporations. The 320 firms with net incomes reported gross incomes of $1,012,043,000; thus 92% of the business done was profitable. Of the $6,372,000 reported as paid in federal taxes, aside from the excise tax on tires and tubes, $5,152,000 was for normal income tax, $1,098,000 in surtax on undistributed profits, and $131,000 on excess profits tax. The normal income tax paid in 1937 was only 70% of that paid in 1936, the surtax on undistributed profits 96%, and the excess profits tax 110%. The data for 1937 are taken from a preliminary report, and those for previous years are from final reports.

CORPORATIONS REPORTING NET INCOME
(Values in thousands of dollars)

Year	Returns	Gross Income	Net Income	Taxes Paid	Net after Taxes
1929	311	916,242	56,324	6,055	50,269
1930	227	559,565	12,242	1,336	10,986
1931	174	401,314	14,004	1,371	12,633
1932	96	127,581	2,779	301	2,478
				XS	
1933	215	300,313	13,339	1,867+ 52	11,420
1934	267	362,756	14,976	2,094+ 20	12,862
1935	286	671,861	30,119	4,141+323	25,654
1936	330	910,991	54,771	8,520+119	46,132
1937-P	320	1,012,043	47,454	6,241+131	41,080

	Reporting No Net Income			All Corporations		
Year	Returns	Gross Income	Deficit	*Returns	Gross Income	Net after Tax and Deficit
1929	303	510,967	39,191	638	1,427,209	11,078
1930	354	540,748	63,876	607	1,100,313	—52,970
1931	361	415,317	38,154	552	816,631	—25,521
1932	426	507,935	41,517	544	635,516	—39,039
1933	330	418,134	10,000	572	718,447	1,420
1934	340	393,498	10,566	650	756,254	2,296
1935	312	116,885	6,989	632	788,746	18,665
1936	259	50,872	3,183	618	961,863	42,949
1937	294	94,911	3,712	643	1,106,954	37,368

[1] From *Rubber News Letter*, Oct. 31, 1939.
P—Preliminary statistics.
*Under "all corporations" returns from "Inactive" corporations are counted.
XS—Excess profits tax.

Dividends Declared

Company	Stock	Rate	Payable	Stock of Record
American Hard Rubber Co.	Com.	$2.50 yr. end	Dec. 23	Dec. 15
American Hard Rubber Co.	8% Pfd.	$2.00 q.	Dec. 23	Dec. 15
Armstrong Cork Co.	Com.	$1.00 yr. end	Dec. 23	Dec. 8
Collyer Insulated Wire Co.	Com.	$0.20 extra	Dec. 27	Dec. 20
Collyer Insulated Wire Co.	Com.	$0.10 q.	Dec. 27	Dec. 20
Detroit Gasket & Mfg. Co.	Com.	$0.25	Jan. 20	Jan. 5
DeVilbiss Co.	Com.	$0.50 irreg.	Jan. 15	Dec. 30
DeVilbiss Co.	Com.	$1.00 yr. end	Dec. 27	Dec. 22
DeVilbiss Co.	Pfd.	$0.17½ q.	Jan. 15	Dec. 30
Dewey & Almy Chemical Co.	Com.	$0.25 yr. end	Dec. 23	Dec. 20
Dewey & Almy Chemical Co.	B.	$0.25 yr. end	Dec. 23	Dec. 20
Dunlop Tire & Rubber Goods Co., Ltd.	Com.	$0.50 initial	Dec. 29	Dec. 15
Dunlop Tire & Rubber Goods Co., Ltd.	1 Pfd.	$0.62½ s.	Dec. 30	Dec. 15
Faultless Rubber Co.	Com.	$0.25 extra	Jan. 1	Dec. 15
Faultless Rubber Co.	Com.	$0.25 q.	Jan. 1	Dec. 15
Firestone Tire & Rubber Co.	Com.	$0.25	Jan. 20	Jan. 5
Fisk Rubber Corp.	Pfd.	$1.50 q.	Dec. 20	Dec. 11
Flintkote Co.	Com.	$1.00 yr. end	Dec. 20	Dec. 13
Garlock Packing Co.	Com.	$1.00 yr. end	Dec. 23	Dec. 16
General Tire & Rubber Co.	Pfd.	$1.50 q.	Dec. 30	Dec. 20
Gillette Rubber Co.	Com.	$0.75 irreg.	Dec. 20	Dec. 1
B. F. Goodrich Co.	$5 Pfd.	$1.25 q.	Dec. 30	Dec. 19
Goodyear Tire & Rubber Co.	Com.	$2.50 extra	Jan. 31	Dec. 30
Goodyear Tire & Rubber of Canada	Com.	$0.63 q.	Dec. 15	Jan. 2
Hercules Powder Co., Inc.	Com.	$1.65 yr. end	Dec. 22	Dec. 11
Hercules Powder Co. Inc.	Pfd.	$1.50 q.	Feb. 15	Feb. 2
Intercontinental Rubber Co.	Com.	$0.20 resumed	Dec. 27	Dec. 11
Jenkins Bros.	Com.	$0.50 yr. end	Dec. 22	Dec. 14
Jenkins Bros.	Founders stock	$2.00 yr. end	Dec. 22	Dec. 14
Jenkins Bros.	Pfd.	$1.75 q.	Dec. 22	Dec. 14
I. B. Kleinert Rubber Co.	Com.	$0.50	Dec. 9	Dec. 21
Lee Rubber & Tire Corp.	Com.	$0.75 special	Feb. 1	Jan. 15
Link Belt Co.	Com.	$0.50 extra	Dec. 26	Dec. 8
Link Belt Co.	Com.	$0.25 q.	Mar. 1	Feb. 10
Mansfield Tire & Rubber Co.	Com.	$0.25 q.	Dec. 23	Dec. 18
Minnesota Mining & Mfg. Co.	Com.	$0.75 yr. end	Dec. 22	Dec. 15
Okonite Co.	Com.	$0.50 resumed	Dec. 15	Dec. 8
Pahang Rubber Co., Ltd.	Com.	$0.25 resumed	Dec. 18	Dec. 11
Plymouth Rubber Co., Inc.	Class B	$1.00 yr. end	Dec. 15	Dec. 8
Plymouth Rubber Co., Inc.	7% Pfd.	$1.75 q.	Jan. 15	Dec. 8
Pharis Tire & Rubber Co.	Com.	$0.15	Dec. 20	Dec. 5
Rome Cable Corp.	Com.	$0.10	Jan. 2	Dec. 14
Seiberling Rubber Co.	A Pfd.	$1.25	Jan. 2	Dec. 15
U. S. Rubber Reclaiming Co.	Pr. Pfd.	$1.00	Dec. 27	Dec. 22
Westinghouse Electric & Mfg. Co.	Com.	$1.00 yr. end	Dec. 22	Dec. 1

New Incorporations

Lane's, Inc., 921 Bergen Ave., Jersey City, N. J. Capital 30 shares. L. Bell, F. Covner, and M. Marsleet, all of 921 Bergen Ave., and C. V. Lane, 321 Knickerbocker Rd., all of Englewood, N. J. Manufacture tires, tubes, and other rubber products.

Mondial Latex Mfg. Co., New York, N. Y. Capital 200 shares, no par value. D. A. Pisik, 70 Pine St., New York. Rubber fabrics.

The Newth Rubber Co., Barrington, R. I. Capital $25,000, consisting of 250 shares of preferred stock at $100 each and 250 shares of common stock, no par value. O. L. Heltzen, F. A. Pryse, and D. J. Higgins.

The Pexlastic Corp., Central Falls, R. I. Capital 250 shares of common stock, no par value. C. P. Sisson, E. G. Fletcher, and E. H. Squire, all of Providence, R. I. Manufacture rubber thread and textiles.

The Providence Rubber & Gasket Co., Inc., Providence, R. I. Capital 100 shares of common stock, no par value. E. J. White, 99 Herbert St., E. Greenwich, R. I., E. J. Sullivan, and H. Lisker.

Triple Cities Rubber Co., Kirkwood, N. Y. Capital $50,000. C. Rozen, 42 Grand Blvd., V. Rozen, 38 Grand Blvd., S. Rozen, 20 DeRussey St., and L. Kutz, 41 Pennsylvania Ave.

CANADA

B. F. Goodrich Rubber Co. of Canada, Ltd., Kitchener, Ont., through General Manager G. M. Sawin, has announced several changes in production, technical, and sales staffs. Harry Cox, formerly in mechanical sales, has been made production manager in charge of mechanical goods, tank lining, and roll covering. This position has recently become of added importance because of the company's greatly increased facilities newly installed for handling large tanks and rolls. J. W. Vila, formerly with the Westinghouse company, Hamilton, Ont., has been added to the sales force. M. A. Reinhart is now in charge of technical work, succeeding J. H. Daniell, transferred to the Goodrich plant in Mexico City. New additions to the technical staff include Ralph F. Wolf, Akron, and Harold Pletch, recent Queen's University graduate. Mr. Wolf is the author of "India Rubber Man," biography of Charles Goodyear which was published last year.

Dominion Rubber Co., Ltd., Montreal, P. Q., has named Paul C. Jones president, following the retirement of W. A. Eden, who becomes vice chairman of the board of directors. Mr. Jones was formerly chairman of the Board of Terminal Warehouses, Toronto, and affiliated companies.

Canadian Industries, Ltd., New Toronto, Ont., has announced the appointment of Herbert Odd to its engineering staff. Mr. Odd, formerly with the Goodrich company, will be located at the C.I.L. munitions plant, Brownsburg.

R. C. Berkinshaw, general manager and treasurer of the Goodyear Tire & Rubber Co. of Canada, Ltd., New Toronto, Ont., and a director and treasurer of the Goodyear Cotton Co., Ltd., recently was elected a director of the Crown Trust Co., Ltd., Montreal.

FROM OUR COLUMNS

50 Years Ago—January, 1890

The revolution in Brazil causes considerable anxiety about the future of Para rubber. Should this commodity reach the high price that is sometimes predicted, would not the American manufacturers have a right to expect that chemists should produce for them an artificial rubber equal in every way to Para? (p. 72)

A notable thing about Christmas this year was the great number of Macintoshes and fine rubber garments given as presents. (p. 76)

We think it must be a Yale student who is responsible for the statement that a lady, walking down State St. in New Haven, slipped upon the sidewalk, fell, and caused a loud explosion, attributed to the bursting of her rubber bustle. (p. 76)

To the town of Waterbury, Conn., belongs the unique honor of having as a resident a gentleman who sold the first pair of rubber shoes ever manufactured in this country. This gentleman, a shoe dealer by profession, is named Ladd. (p. 76)

The calender [in the Trenton Rubber Works] refused to keep to the requisite degree of coolness without a constant stream of water running through the rolls. As city water is quite expensive in Trenton, the manager built an ice box above the machine and ran ice water into the rolls. The scheme works to perfection, cooling the rolls at the briefest notice, and saving much in the way of water tax. (p. 77)

The Home Rubber Co., Trenton, N. J., for the last three months have been obliged to run night and day to fill their orders, and this in spite of the new grinders and presses recently added to their plant. (p. 78)

The absorption of water by insulating substances is a matter of considerable importance. In this respect india rubber yields distinctly less favorable results than gutta percha. While some materials incorporated with india rubber retard the rate of penetration to an enormous extent, it still takes place to a degree which would render its use in water extremely undesirable. (p. 88)

25 Years Ago—January, 1915

Of all the developments of the last 25 years in the rubber industry, the plantation, with its assurance of perennial plenty, is far the greatest. (p. 180)

The first rubber factory was started in Germany in 1829, near Berlin, and was devoted to making rubber thread and elastic fabrics. (p. 182)

Dr. Duisberg and his co-laborers, Drs. Fritz Hofmann and Carl Harries, are celebrated among chemists for the work they have been doing for a number of years past on the absorbing problem of synthetic rubber. (p. 183)

For many years Charles Ensign, who came to the Goodyear Metallic Rubber Shoe Co. about 1859, and was superintendent until the Fall of 1881, was the recognized authority on making [rubber shoe] varnish. (p. 188)

H. Dreyfus has received British patent No. 17,191 (1914) for a method of producing synthetic rubber, which seems to include almost everything that can be or has been done in that line. (p. 196)

For the first time in the history of the crude rubber export, plantation rubber is coming to the United States by way of the Pacific. Shipments from Java are now sent to Hong Kong, transferred to the Pacific Mail, and landed at San Francisco. (p. 205)

A number of experiments were made during the last year to test the specific gravity of latex, from which a suitable latex hydrometer has been constructed. (p. 228)

The problem of variability in plantation rubber is an extremely complicated one, and it will be years before the full value of this work can be realized. (p. 229)

Rubber and Canvas Footwear Statistics

Thousands of Pairs

	Inventory	Production	Shipments
1937	20,430	74,102	67,191
1938	16,183	50,812	54,942
1939			
Jan.	16,157	4,807	4,778
Feb.	16,582	4,953	4,629
Mar.	17,281	5,897	5,214
Apr.	18,083	5,216	4,414
May	19,055	5,033	4,017
June	19,729	4,866	4,192
July	18,115	3,280	4,894
Aug.	16,956	5,090	6,213
Sept.	15,218	4,713	6,452
Oct.	14,619	5,332	5,916

The above figures have been adjusted to represent 100% of the industry based on reports received which represented 81% for 1936-37.

Source: *Survey of Current Business*, Bureau of Foreign & Domestic Commerce, Washington.

EUROPE

GERMANY

Use of Synthetic Rubbers

Buna and other synthetics are growing in importance in the German economical scheme, and recent issues of various technical publications deal with the new uses for these materials and the problems connected with their use. P. Wiessner[1] discusses their application in the production of hose. The superior resistance to heat, benzene, and oil of Buna S, Buna 85, Perbunan, and Perbunan Extra make them first choice for this purpose. But other materials with special properties are also being used. Thus the Perdurens C, H, and L show unusually high resistance to swelling; Igelit PCU and MP, though less elastic, are just as oil-resistant. Oppanol B 200 is especially serviceable where chemicals and acids are handled. "Thiokol" is very resistant to lubricants, weather, and moisture. When softeners are added to Mipolam, hose of rubber-like consistency is obtainable. Plexigum, an acryl resin, colorless, tasteless, and odorless, can be extruded, and under the name of Borron is used as cable covers. Guttasyn and Decelith W are non-inflammable as well as resistant to acid, oils, and alkali. Decelith W can also be colored.

Buna for balloon fabric has been found superior to natural rubber, it is claimed, being less permeable and having greater aging resistance. According to a press report, a free balloon having a cover treated with Buna was sent up for the first time in August, 1939, in rain and wind and was reported to have stood the test in a very satisfactory manner.

The use of synthetics for insulating cables for warships is mentioned by Ch. Breitenstein.[2] Such cables are usually covered with lead which, though answering the requirement of watertightness, has the disadvantage of being very heavy. Tests with various synthetics indicated that while serviceable insulations for land purposes could be made from thermoplast mixes, these did not sufficiently resist the heat conditions on ships. Thus mixes of PCU, subjected to 100° C. disintegrated after about 70 days. But satisfactory sheaths appear to have been produced from a mix made of Buna N—or Perbunan—and a certain amount of Plexigum together with the usual softeners, accelerators, and fillers. When these were subjected to the same conditions as the PCU mixes, the only effect was some hardening, considered harmless. Experience with Buna-Plexigum cables is still too recent and too inadequate to justify their wholesale substitution for lead-covered cables on warships at present. But the advantage they offer because of their comparative lightness makes it probable that they may eventually largely replace lead-covered cables.

[1] *Chem. Ztg.*, 63, 438-39 (1939).
[2] *E T Z*, 60, 28, 839-42 (1939).
[3] *Gummi-Ztg.*, July 14, 1939, p. 744.

Nerve of Natural Rubber and Buna

Comparing the nerve of natural rubber and of Buna, M. Capesius[3] points out that sometimes it is erroneously said that Buna has no real nerve. It has a nerve, he declares, which though not so easily felt as that of natural rubber, is harder to destroy. Another difference between the two materials is that while freshly cut edges of masticated natural rubber are easily joined by light pressure and are then hard to separate again, the freshly cut edges of Buna do not adhere nearly so readily nor so firmly.

That Buna has a different kind of nerve which is hard to destroy is also evident as it is impossible to obtain as smooth a sheet from Buna as from rubber, even when the former has been worked until it is soft enough to show cold flow. Again Buna shows more marked calender effect which can only be corrected by careful selection of very special softeners. Finally, to obtain uniformly smooth hose from Buna mixes, special regulation of temperature in the extrusion head of the tubing machine is required and a specially constructed nozzle must be used.

Notes

The Berlin District Group of the Deutsche Kautschuk Gesellschaft met on October 20, 1939, after a fairly considerable interval. Dr. Philippoff, of the Kaiser-Wilhelm Institute for Chemistry, spoke on "The Determination of Material Constants in Synthetic and Natural Rubber," confining himself in his address to matters pertaining to plasticity.

The Selling Organization of German Rubber Thread Factories of Cologne reports for the first half of 1939 improved business as a result of the revival of the international market for elastic goods. But the second half of the year is likely to show a recession for German trade in this field owing to prevailing conditions. Meantime it is also learned that the International Rubber Thread Association at Zurich, Switzerland, is ceasing activities for the duration of the war.

GREAT BRITAIN

War Uses of Rubber

The dangers that threaten belligerents both from the air and the sea are being met by a rapid development of ingenious devices, both protective and offensive, in which rubber frequently plays an important part. In some cases earlier known devices are modified to suit conditions entirely different from those for which they were originally intended. Collapsible rubber boats for instance are not new. Before the war they were popular with campers and trippers in Germany and to a certain extent also in England and America. Now they form part of the equipment of airplanes of the Royal Air Force and recently figured in a spectacular exploit whereby two airplanes rescued 34 men from a lifeboat after their ship had been torpedoed. After sighting the survivors and alighting nearby on the water the planes launched two small collapsible rubber boats, which are so designed as to inflate automatically upon reaching the water, and ferried the entire crew, three at a time, to the planes. The officers of the planes received the Distinguished Flying Cross from the king for this deed.

Germany also equips some of the planes with collapsible rubber boats, judging from the report that German fliers used such boats in an attempt to escape from their airplanes, brought down by the British in mid-ocean.

When it comes to protecting cities and civilians from airplane attacks, rubber again comes to the fore. Latex to protect windows and black rubber paint for black-out purposes have already been mentioned in these columns. Now come black-out shades and curtains of rubber and rubberized fabric. One railway line uses large rubber window shades which are black on the outside and white on the inside. Strain on the eyes, resulting from coming into the light from the black-out, is relieved by means of special spectacles fitted with perforated rubber cones instead of glasses. Apparently, in this way the light is condensed until the eyes are again accustomed to it. Also, men are offered derbies fitted with special pads of rubber and vulcanite as protection during air-raids.

Notes

Sir Harold B. Hartley, president of the Research Association of British Rubber Manufacturers, is one of three recently appointed members of the Privy Council for Scientific and Industrial Research.

The Patents, Designs, Copyright and Trade Marks Emergency Act, 1939, came into effect September 3, 1939. This act permits patented inventions, registered designs, and copyright works belonging to an enemy or enemy subject to be used or produced in the United Kingdom by persons not enemies or enemy subjects and already hold licenses for the purpose, or can obtain such license from the Controller.

FINLAND

Finland's crude rubber imports in the first half of 1939 were 570 tons, against 1,779 tons in the same period of 1938. Imports of manufactured goods, however, increased on the whole. The main item, automobile tires, reached 548 tons, against 398 tons. Cycle tire covers were 121 against 104 tons; belting was 22 tons, unchanged, hose increased from 18 to 21 tons. The rubber exports consist almost exclusively of footwear, which amounted to 58 against 31 tons.

ITALY

The Sigma concern of Rome, manufacturing mechanical goods, and the new Sigma works built at Torrespaccate in 1935 for the owners of Sigma, Henri and Oscar Ghez to exploit their reclaim process, are reported to have been absorbed by the Societa Italiana Pirelli, Milan. In return the former owners of Sigma have, through Pirelli Holding, of Lucerne, Switzerland, acquired participation in the Société Anonyme Industrie du Caoutchouc Souple, of Pont Cheruy, Isère, France. The latter concern, capitalized at 12,000,000 francs, is one of the most important and up-to-date factories in France, producing rubber footwear, tubings, mechanicals, surgicals, and latex goods. Henri and Oscar Ghez are now to collaborate with the French concern and have been appointed managing directors. It seems that they are introducing the manufacture of reclaim by the process used by Sigma.

Pirelli is understood also to have expanded in a different direction recently; it and the Istituto Ricostruzione Industriale are said to have formed a new company, S.A.Industria Gomma Sintetica, with an initial capital of 1,000,000 lire. The president is Alberto Pirelli, and the vice president, Prof. Francisco Giordani. The factory will probably be at Ferrara. As not long ago the Societa Italiana per la Produzione della Gomma Sintetica established a factory for synthetic rubber at Milano-Bicocca, Italy will now have two producers of synthetic rubber.

HOLLAND

While various methods have been developed to prevent rubber powders from lumping, none so far has proved completely satisfactory. The addition of small amounts of magnesium oxide, talc, zinc stearate, antioxidants, and the like, has been proposed to overcome the difficulty, but by these means the problem has been solved only temporarily, for after a time, there is a reappearance of the tendency to lump.

The Rubber-Latex Co. N.V., the Hague, recently applied for a patent[1] for a method which, it is claimed, not only gives the freshly prepared material a dry loose, fine powdery structure that is lasting, but also yields the same result on rubber powders that have already been treated by other means and have become more or less lumpy. The new process involves the addition of powdered pumice stone, silica gel, infusorial earth, or similar substance with low apparent specific gravity and high moisture absorbing powers.

An instance is given in which an apparently satisfactory rubber powder had been prepared in Netherland India by spraying latex to which 8% of zinc ammonium phosphate has been added. However during shipment to Holland the rubber powder became lumpy, but when 10 parts by weight of infusorial earth were thoroughly mixed with 100 parts by weight of rubber powder, a fine dry rubber powder was again obtained. This material retained its desirable qualities even after being stored for some time at a temperature of 40° C. in an atmosphere saturated with water vapor.

[1] Netherlands patent No. 84,322.

FAR EAST

MALAYA

Tapping Clonal Seed Trees

The first report on commercial tapping of clonal seed rubber, recently issued by the Prang Besar Rubber Estate, Ltd., supports, from the comparative results from this and other types of rubber trees, the advocates of seedlings on the debatable question of the preference of clonal seedlings or bud-grafts. The area under consideration covered 54 acres made up of 27 acres of seedlings from isolated garden seed from a large number of clones, nine acres of budded rubber including the best known Prang Besar clones, nine acres of natural Prang Besar estate seed from high yielding buddings, and nine acres of local Kedah seed.

All trees were tapped at about 5½ years of age, rather early for bud-grafts. The number of trees in tapping per acre was about the same for all four areas. Tapping was started in July, 1939, and with surprising results. The yield per acre per annum for the clonal seedlings worked out at 1,124 pounds; for Prang Besar natural seed, 701 pounds; for the bud-grafts, 533 pounds; and for Kedah local seed, 344 pounds. In August also the isolated garden clonal seed area yielded at a rate more than twice as high as the budded area. The yield of young bud-grafts, it should be pointed out, is frequently lower than that of seedlings of the same age, but later on the bud-grafts catch up with the seedlings and in a few years frequently excel them. It is, however, questionable whether in the present instance the bud-grafts will be able to rival the yields of the clonal seedlings, considering the enormous start the latter have, especially as they also have another point in their favor, greater resistance to disease. The above report, discussing the incidence of black stripe, stated it occurred and infected budded plots rather severely and may have somewhat affected yields, but owing to the method of tapping (each tapper tapping part of each plot) infection risks must have been reasonably even for all material.

Further reports on the commercial tapping of clonal seed will naturally be awaited with the keenest interest. Incidentally, when data over a longer period of tapping are available, it will be enlightening to compare results with those obtained at Polonia, in Sumatra, reported elsewhere in this issue.

"Bare-Back" Rubber

"Bare-Back" and "Naked" rubber are terms applied to rubber shipped without any packing, that is without wooden cases, gunny bags, or matting. This method of shipping rubber was started in 1932 when, with rubber at the ridiculous level it had reached then, economy demanded extreme effort to reduce wrapping expense. The rubber sheet was pressed into bales, wrapped with other sheets of rubber, and the package was coated with a latex and talc solution to prevent the bales sticking together in the hold of the ship, marked, and shipped. The solution has since been perfected, and this method of packing is said to have found favor with several large exporters of crude rubber. The Goodyear Orient Co. ships 10,000 tons of rubber in this package from Singapore monthly, and the plantations of the United States Rubber Co. also use this method of shipment.

JAPAN

Japan has for some time been restricting and controlling imports of various raw materials and at the same time been striving for self-sufficiency. Some months ago control was extended to carbon black, both imported and domestic. Hitherto Japan has been producing about 100 metric tons of carbon black a month; whereas the monthly needs are at present between 250 and 300 tons a month. Imports were 3,729 tons in 1935; 4,639 tons in 1936; 6,031 tons in 1937; and 3,816 tons in 1938. Latest reports state that the Japan Oil Co., the Japan Mining Co., the Chosen (Korean) Nitrogen Co., and others are collaborating with the Department of

Commerce and Industry, Tokyo, to help Japan become completely self-sufficient by February, 1940, as far as carbon black is concerned. The Chosen Nitrogen Co. intends to produce three tons of carbon black from carbide instead of one ton, and the Japan Oil Co. will raise output at the Kinsui oil field (Formosa) from six to eight tons. The chemical laboratory of the Formosa Government is also to take up the problem of making carbon black.

NETHERLAND INDIA

Clones and Seedlings

The General Experiment Station of the AVROS, East Coast Sumatra, in its 1938 report[1] on the clones and seedling families being proved at the Experimental Gardens in Polonia, covers 12 seedling families besides about 200 different clones; of the latter, 33 came into tapping in the beginning of 1938; the others were older. Included with the Java and Sumatra clones were several from Malaya and one from Ceylon. The details have been tabulated and cover the year of planting, number of trees per clone tapped, yield per tree and per hectare as compared with a standard clone (Av. 49), growth, type of stem, resistance to wind damage, bark renewal, disease, etc., so that a very good idea is obtainable of the relative value of the individual clones and seedling families.

It is indicative at once of the careful methods and the high standard aimed at Polonia, and the difficulties attending the selection of clones, that of the 200 clones tested only 10 are considered good both in regard to yield capacity and other qualities. The ten include two Malayan clones, (Pilmoor B.84 and Prang Besar 23), Tjir. 16, Av. 35, Av. 219, Av. 308, Av. 456 (one of the best yielders and all-round clones at Polonia) Av. 464, Av. 470, and Av. 475.

Most of the seedling families were considered good; in general their qualities, as resistance to wind damage, bark renewal, etc., were superior to those of the clones; while the best producers gave yields that equaled those of the 10 clones mentioned. As the author points out, the data clearly prove that the search for good clones is likely to be disappointing in the matter of bark renewal and resistance to wind damage. However, he adds, one cannot from the above conclude definitely that seedlings are to be preferred to clones, seeing that there are high yielding clones which are also satisfactory in other respects.

Tire Import Quotas Up

Import quotas for tires and tubes for motor vehicles have been increased for the year beginning October 3, 1939, from 1,702,520 to 2,138,812 kilos for tires for automobiles, motor trucks, and motor cycles, and from 194,170 to 231,900 kilos for tubes for such vehicles.

[1] "Report to End of 1938 from the Experimental Gardens of Clones and Seedling Families in Polonia." J. F. Schmole, *Arch. Rubbercultuur*, 23, 3, 141-61 (1939).

Crude Rubber Exports

The Central Bureau of Statistics sets Netherland India exports of crude rubber and latex for September, 1939, at 38,353,490 kilos, with estate rubber from Java and Madoera totaling 5,283,772 kilos including 32,843 kilos in the form of manufactured rubber and 16,765 kilos of latex. Estates in the Outer Provinces shipped 10,319,296 kilos including 1,573,420 kilos of latex. Native rubber exports came to 22,750,422 kilos.

Effects of Increased Quotas

The sudden and comparatively sharp increases in the percentage of permissible rubber exports decided upon in September have had a rather unusual effect on local dealings in estate rubber. It seems that with Java growers unable to adjust outputs to meet the new exportable so rapidly as in Sumatra, the market price for spot rubber in Java rose above that prevailing in Deli, Sumatra. This difference appears to have caused Deli estates to make considerable shipments to Java to be sold there and reexported, unheard of before.

Incidentally, the larger permissible exports have created a certain shortage of labor in Sumatra, and labor-recruiting, especially for East Coast of Sumatra, has been very active again.

BELGIAN CONGO

Rubber growing will be considerably extended in the Belgian Congo. The Soc. Financiere des Colonies and the Soc. Financiere des Caoutchoucs have together formed a new company, Compagnie de Hevea, capitalized at 20,000,000 francs, which has obtained a concession from the Government of the Belgian Congo covering 20,000 hectares, half to be opened up immediately.

Many years ago Belgian Congo was an important exporter of wild rubber, having shipped as much as 5,954 tons in 1901. However the method of exploitation followed at the time exhausted the sources of nearby rubber, and shipments fell steadily. When rubber planting proved successful, *Hevea* was planted here too on a small scale; the estimated area under *Hevea* at present is about 6,000 acres producing about 400 pounds per acre. Since 1935, exports of rubber from these plantations have increased regularly. In 1938 the crude rubber shipments from Belgian Congo totaled 1,136 tons, practically all of which was plantation rubber going to Belgium. The rubber consumption of this little country was estimated to have been well over 10,000 tons in 1938.

MIDWEST

(*Continued from page* 61)

technical or social organizations. The tentative program for the conference includes some twenty-five important subjects to be discussed by authorities from educational and industrial fields in all parts of the country and will place special emphasis on steam, diesel, electric, and hydraulic power.

National Safety Council, 20 N. Wacker Dr., Chicago, Ill., through Managing Director W. H. Cameron has announced that his assistant, R. L. Forney has been made director of the council's industrial division, effective January 1, succeeding W. Dean Keefer, who resigned to join the Lumbermens Mutual Casualty Co., Chicago. Mr. Forney, who will continue as assistant to the managing director, has been head of the N.S.C. statistical department for 12 years, and his successor in that capacity is Wm. Johnson, a statistician with the council three years.

BOOK REVIEW

"Chemicals of Commerce." Foster Dee Snell and Cornelia T. Snell. Published by D. Van Nostrand Co., Inc., 250 Fourth Ave., New York, N. Y. 1939. Cloth, 5½ by 8½ inches, 542 pages. Indexed. Price $5.

Prepared to meet a definite need, this reference volume is intended as a source of information on the composition of actual commercial products. It does not cover all chemical compounds, as a chemical dictionary does, but gives more detailed information than such a source on products of definite trade importance. The price-quotation pages of current trade publications have been used as the principal criterion of what is sold in sufficient quantity to recommend inclusion. The subject matter is covered in 37 chapters, and classification is by type of compound so that closely related substances will occur in the same chapter.

Two pages are devoted to a somewhat elementary and brief discussion of natural rubber. Neoprene and "Thiokol," termed "rubber replacements" by the authors, are briefly mentioned, as are also Pliofilm, Pliolite, chlorinated rubber, and rubber substitute. Many of the compounding materials used in rubber manufacture are covered, among them: carbon black, China clay, bentonite, sulphur, zinc oxide, rubber solvent.

Editor's Book Table

NEW PUBLICATIONS

"Rubber—Plastic—and Special Machinery." National-Erie Corp., Erie, Pa. This folder contains six circulars in colors, each devoted to one of the following types of machinery for the rubber industry; tilting-head hydraulic platen press; Simplex doors for vulcanizers, pot heaters, and autoclaves; hydraulic presses for mechanical rubber and plastic materials; mixing mills; tubers for tubing, straining, and insulating; and Akron clutches. Detailed descriptions of construction and working principles and clear-cut pictures give the reader an excellent idea of the features and advantages of each type of machine covered to suit his particular needs.

"News about Du Pont Rubber Chemicals." E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. With this news letter of November 29 were two reports: (1) "Footwear Compounding—Rubber and Neoprene," by A. J. Northam, which reviews the use of du Pont chemicals in rubber footwear compounding and discusses the use of new types of Neoprene for oil resisting footwear, including formulas and physical test data; (2) a reprint from *Rubber Age* (*N. Y.*), which deals with "Special Testing Apparatus in the Du Pont Rubber Laboratories."

"Goodrich Acidseal Paints." The B. F. Goodrich Co., Akron, O. 4 pages. This catalog section deals with Acidseal paints, the firm's line of protective coatings for resistance to acids, alkalies, salt spray, and moisture. The base of these paints is Thermoprene, a rubber isomer made by treatment with sulphonic acids. Eight different types of coating materials, each with its special properties, are described: aluminum, graphite, black, floor coating, two types of white, and two primers. Acidseal coatings are of interest to the rubber industry because of their protective value for vulcanizing presses and heaters, latex tanks and pipe lines, laboratory equipment and walls, and other uses such as protection against acids, alkalies, and sulphur fumes.

"Improved American Bracketubes for Steam Heated Platen Presses." American Metal Hose Branch of The American Brass Co., Waterbury, Conn. 12 pages. This booklet describes the Bracketube, a seamless flexible metal tube, with a patented support, for conveying steam or water to and from the platens of a hydraulic press. Illustrations cover typical press installations, and complete specifications are given for each of the four styles of Bracketubes. Loop installations of flexible metal tubing and detachable fittings for the tubing are also briefly dealt with.

"Hydraulic Molding Presses—1939." Stewart Bolling & Co., Inc., Cleveland, O. 16 pages. The first part of this catalog illustrates and describes the firm's line of ring and semi-ring type of presses. Utilizing a single tension member of rolled steel plate, these presses are said to be radically different in design from the conventional strain rod type of press. New four-bolt and slab side presses are covered in the second section of the booklet. Additional pages illustrate other rubber machinery manufactured by the firm, including mills, calenders, rubber bale cutters, and vulcanizers.

"Cotton and Cotton Waste." United States Tariff Commission, Washington, D. C. For sale by the Superintendent of Documents, Washington. 10¢. 51 pages. This report of the United States Tariff Commission to the President recommends that cotton imports from various countries be limited by quota. Results of the investigation on cotton imports and a proclamation by the President making the restriction of imports effective are included.

"Hewitt Magazine." Vol. I, No. 3, Autumn, 1939. Hewitt Rubber Corp., Buffalo, N. Y. 16 pages. The latest issue of this company publication features articles on: the world's largest fire hose order which was awarded Hewitt by the British Government; rubber in the construction industry, enumerating the various types of rubber goods for this purpose; synthetic rubber convever belt for oil-treated coal; and sludge disposal.

"Employers' Digest of the Fair Labor Standards Act of 1938." United States Department of Labor, Wage and Hour Division, Washington, D. C. 6 pages. This pamphlet describes in simple lay language the most important provisions of the Wage-Hour law as it affects employers. Particular stress has been laid upon the calculation of overtime pay and the record-keeping requirements of the act. Penalties, child labor, and exemptions also are touched upon. If any reader desiring a copy will communicate with us, we will inform him of the nearest Wage and Hour Field Office to which he may write.

"How to Buy, Sell, and Burn Coal." Thomas A. Marsh, 5625 Kenwood Ave., Chicago, Ill. 96 pages. Tables. Price, $1. In ten concise chapters the author discusses the importance of fuels; what purchasers should know about coal and how to select it; fundamentals and sizing of coal burning equipment; service work and general information; schematic analysis of trouble with effects, causes, and remedies; boiler tests; smoke abatement; and general combustion information.

"A New Scientific Method of Grading and Specifying Rubber Carbon Blacks." Godfrey L. Cabot, Inc., Boston, Mass. 24 pages. The basis of grading rubber carbon blacks presented in this booklet is based on the premise that the fundamental reenforcing properties of different grades of blacks are revealed only after the effects of rate of cure variations have been eliminated. Nine different grades of Cabot blacks are considered. It is shown that the present practical limits of desirable properties are represented in Grades 1 and 9. The maximum or optimum of each of the following characteristics is reached in either of these two grades: tensile, elongation, modulus, hardness, resilience, hysteresis loss, heat generation, abrasion resistance, flex cracking, tear resistance, plasticity, electrical conductivity, color, DPG adsorption, and volatile content. Other grades of black differ in an orderly progression, and the report points out that the exact grade of carbon black may be thus selected for a particular purpose.

"Crude Rubber." United States Tariff Commission, Washington, D. C. 37 pages. This report, issued December 11, describes the present situation respecting crude rubber with special reference to the effect of the war upon United States imports. The report, which points out that crude rubber was the most important single commodity imported into the United States in 1937, covers: rubber regulation; statistics on imports, production, consumption, stocks, and prices; transportation and marketing; American-controlled plantations abroad; exchange of rubber for cotton; substitutes for rubber; and conservation of rubber.

"Cotton Production and Distribution —Season of 1938-39." United States Department of Commerce, Washington, D. C. For sale by the Superintendent of Documents, Washington, 10¢. 52 pages. Bulletin 176 presents statistics for the twelve months ending July 31, 1939, on: supply and distribution of cotton and linters in the U. S.; cotton production, consumption, and stocks in the U. S.; imports and exports of cotton; world's production and consumption of cotton; and cottonseed and cottonseed products.

"Goodrich Air-Cell Cushion for Car and Bus Seats, Mattresses, Furniture." The B. F. Goodrich Co., Akron, O. This six-page circular, consisting mostly of illustrations, presents highlights of this new cushion, which has 90 to 93% air space, a quarter-million air cells to each cubic inch, and is made from foamed latex. "The Cushion That Breathes" can be molded to nearly any shape and put to special uses; yet the manufacturer claims it holds its shape, absorbs vibration, gives soft, gentle support to the body, has long life, and its softness and percentage of air can be regulated both by the texture of the material and size of molded openings.

"Reeves Variable Speed Control." Catalog No. G-397. Reeves Pulley Co., Columbus, Ind. Loose-leaf binder, 122 pages. Illustrations. Tables. Diagrams. Index. This catalog presents a complete line of equipment for any requirement in adjustable machine speeds. The main subjects are variable speed transmission, Vari-speed motor pulley, and Vari-speed Motodrive. Points covered include operating principle and design, construction detail, applications, industrial uses, and engineering data. Of particular interest to the rubber industry is the illustration: synchronizing capstan speeds with delivery rate accomplished on a rubber panning machine by two vertical design Reeves units. Also, solid rubber V-belts are used on some of the equipment, and Motodrives are mounted on rubber.

"'Latextile' Rubber Thread." William Warne & Co., Ltd., India Rubber Mills, Barking, Essex, England. 20 pages. Illustrated. This colored brochure, dealing with some of the problems with which the thread manufacturer has to contend, treats generally of the method of manufacture of "Latextile" square-cut rubber thread, covering such points as mastication, compounding, fabrication, and vulcanization; and tests of all types, i.e., aging, tension, chafing, boiling, sunlight, braid, fatigue, and washing, including a technical report on the last named.

"Inspected Electrical Equipment." November, 1939. Supplement. Underwriters' Laboratories, Inc., 207 E. Ohio St., Chicago, Ill. Paper, 97 pages. This supplement contains listings established subsequent to the May, 1939, list, which must also be consulted for complete information relative to names of manufacturers and appliances approved. Among the items mentioned are rubber plug caps, rubber covered cords and wires, cables, radio receivers, and box connectors.

"Du Pont 'Texon' Has Left Its Imprint on the Shoe Industry in the United States." E. I. du Pont de Nemours & Co., Inc., Russell, Mass. 14 pages. "Texon," the subject of this booklet, is the trade name used to identify a family of simulated leather products, employed in the manufacture of shoes and made by saturating a wet web of fiber with latex in a continuous process. "Texon" innersole, midsole, and socklining are described, and full-sized samples of each type are attached to the pages for close examination.

COMPOUNDS FOR THE MANUFACTURE OF CABLES AND WIRES. S. Bostrom, *Gummi-Ztg.*, Oct. 6, 1939, pp. 1030-1031; Oct. 13, pp. 1048-1050.

CHRONOLOGICAL REVIEW OF EARLY RUBBER HISTORY. L. Eck, *Gummi-Ztg.*, Sept. 29, 1939, p. 1015; Oct. 6, p. 1032; Oct. 13, pp. 1050-1051. (To be continued.)

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ASSISTING THE SMALL RUBBER GROWER. *India Rubber J.*, Nov. 25, 1939, p. 7.

EFFECT OF THE PHYSICAL AND CHEMICAL PROPERTIES OF CARBON BLACK ON ITS ELECTRICAL RESISTIVITY. G. L. Roberts and E. G. Emmert, *Rubber Age (N. Y.)*, Dec., 1939, pp. 159-62.

MODERN ANTISEPTICS FOR THE RUBBER INDUSTRY. R. A. Engel, *Rubber Age (N. Y.)*, Dec., 1939, pp. 163-64, 171.

TENSOLITE — "TENSILIZED" RUBBER HYDROCHLORIDE. *Rubber Age (N. Y.)*, Dec., 1939, pp. 165-67.

DIGEST OF THE FAIR LABOR STANDARDS ACT. *Rubber Age (N. Y.)*, Dec., 1939, pp. 169-71.

EMERGENCY LEGISLATION. *Bull. Rubber Growers' Assoc.*, Sept.-Oct., 1939, pp. 474-88.

RUBBER EXPORT PROHIBITIONS. *Bull. Rubber Growers' Assoc.*, Sept.-Oct., 1939, p. 489.

EXCESS PROFITS TAX. *Bull. Rubber Growers' Assoc.*, Sept.-Oct., 1939, pp. 490-96.

EXCHANGE OF COTTON AND RUBBER. *Bull. Rubber Growers' Assoc.*, Sept.-Oct., 1939, pp. 497-502.

RUBBER AND ICE ON AIRCRAFT. *India Rubber J.*, Nov. 11, 1939, p. 10.

PLANTING WITHOUT BURNING. *India Rubber J.*, Nov. 11, 1939, pp. 11-12.

PROTEIN: The Hermaphrodite Guard. F. H. Cotton, *India Rubber J.*, Nov. 11, 1939, pp. 13-14.

EFFECT OF RUBBER VARIABILITY ON VULCANIZATION. J. D. Hastings and E. Rhodes, *Ind. Eng. Chem.*, Dec., 1939, pp. 1455-60.

CONTROL BY INDIVIDUAL INCORPORATION OF VULCANIZING AGENTS. D. F. Twiss, *Ind. Eng. Chem.*, Dec., 1939, pp. 1461-64.

VULCANIZATION FROM A THERMODYNAMIC VIEWPOINT. I. Williams, *Ind. Eng. Chem.*, Dec., 1939, pp. 1464-68.

OXIDATION OF VULCANIZED RUBBER. A. R. Kemp, J. H. Ingmanson, and G. S. Mueller, *Ind. Eng. Chem.*, Dec., 1939, pp. 1472-78.

TEMPERATURE COEFFICIENT OF VULCANIZATION. R. H. Gerke, *Ind. Eng. Chem.*, Dec., 1939, pp. 1478-81.

EFFECT OF RECLAIMED RUBBER ON TEMPERATURE COEFFICIENT OF VULCANIZATION. W. S. Coe, *Ind. Eng. Chem.*, Dec., 1939, pp. 1481-85.

VULCANIZATION OF LATEX. C. E. Bradley, *Ind. Eng. Chem.*, Dec., 1939, pp. 1485-88.

HEVEA LATEX OF LARGE PARTICLE SIZE. J. McGavack, *Ind. Eng. Chem.*, Dec., 1939, pp. 1509-1512.

PLANTATION RESEARCH. H. Ashplant, *India Rubber J.*, Nov. 18, 1939, pp. 3-5.

RUBBER AND THE BREWING INDUSTRY. J. P. Griffiths, *India Rubber J.*, Nov. 18, 1939, pp. 11-15; Nov. 25, pp. 11-16. (To be continued.)

WORKING UP THIOKOL. O. Kolbl, *Gummi-Ztg.*, Nov. 3, 1939, pp. 1101-1102; Nov. 10, p. 1118. (To be continued.)

MANUFACTURE OF HOT WATER BOTTLES. *Gummi-Ztg.*, Nov. 10, 1939, pp. 1116-17.

DETERMINATION OF MANGANESE IN CRUDE RUBBER, COMPOUNDS AND FILLERS. Contribution to the Analysis of Rubber. IV. P. Dekker, *Kautschuk*, Nov., 1939, pp. 179-82.

THE PYROLYSIS OF ETHYLENE. A Synthesis of Butadiene from Ethylene or Ethylene and Acetylene. M. Schultze and G. R. Schultze, *Kautschuk*, Nov., 1939, pp. 182-85. (To be continued.)

HEVEA CULTIVATION IN INDO-CHINA. A Thomas, *Rev. gén. caoutchouc*, Sept., 1939, pp. 248-56. (To be continued.)

THE PLASTIC STATE: Measurement of Plasticity. P. Bary, *Rev. gén. caoutchouc*, Sept., 1939, pp. 260-263.

APPLICATIONS OF THE MANOMETRIC METHOD OF MEASURING THE OXIDABILITY OF RUBBER: Oxidability and Aging in the Geer Oven. C. Dufraisse and J. Le Bras, *Caoutchoucs et Plastiques*, June, 1939, pp. 37-42.

SOME PROPERTIES OF RUBBER AND SYNTHETICS APPLIED TO ELECTRICAL CONDUCTORS. G. Chevassus, *Caoutchoucs et Plastiques*, June, 1939, pp. 43-53.

THERMOPLASTICS AND THEIR USE IN THE RUBBER INDUSTRY. A. Schwarz, *Caoutchoucs et Plastiques*, June, 1939, pp. 54-59.

THE BELGIAN RUBBER INDUSTRY AND ITS RELATIONS WITH THE OTHER INDUSTRIES. G. Paquet, *Caoutchoucs et Plastiques*, June, 1939, pp. 60-63.

ADHESION OF RUBBER TO ARTIFICIAL SILK. W. Schlitt, *Gummi-Ztg.*, Sept. 15, 1939, pp. 975-76.

U. S. Crude and Waste Rubber Imports for 1939

	Plantations	Latex	Paras	Africans	Centrals	Guayule	Totals 1939	Totals 1938	Balata	Miscellaneous	Waste
Jan. .....*tons*	36,672	1,521	560	56	9	264	39,082	42,135	61	803	328
Feb.	34,185	1,463	239	348	3	252	36,490	43,930	45	685	54
Mar.	36,434	1,885	229	208	4	229	38,989	35,967	33	649	29
Apr.	27,991	784	487	142	1	196	29,601	30,807	65	275	246
May	44,015	2,167	413	761	7	172	47,535	27,410	78	759	151
June	33,956	1,489	318	42	3	139	35,947	26,011	107	680	7
July	33,211	2,511	456	292	..	269	36,739	22,918	46	884	104
Aug.	34,801	2,260	276	453	2	253	38,045	31,099	46	766	42
Sept.	39,148	2,312	324	...	42	113	41,939	37,374	92	444	8
Oct.	38,202	1,863	363	355	160	307	41,250	34,496	159	582	65
Nov	39,086	2,026	650	324	312	188	42,586	31,054	116	293	181
Total, 11 mos., 1939 .....*tons*	397,701	20,281	4,315	2,981	513	2,412	428,203	.....	848	6,820	1,215
Total, 11 mos., 1938 .....*tons*	346,142	9,771	3,047	1,689	230	2,322	.....	363,201	641	8,036	527

Compiled from The Rubber Manufacturers Association, Inc., statistics.

Patents and Trade Marks

MACHINERY*

United States

2,180,556. **Tread Slitter.** H. E. Sipe, New York, N. Y.

2,180,604. **Heel Trimmer.** T. W. Morris, Chicago, Ill.

2,181,273. **Press.** C. Iverson, assignor to National Rubber Machinery Co., both of Akron, O.

2,181,398. **Strip Cutter.** V. S. Firestone, assignor to Pharis Tire & Rubber Co., both of Newark, O.

2,181,558. **Retread Mold Pressure Plate Attachment.** G. O. Beckman, assignor to Super Mold Corp., both of Lodi, Calif.

2,181,859. **Vulcanizer.** W. J. Baker, W. Somerville, and C. J. H. Perry, No. Quincy, assignors to Boston Woven Hose & Rubber Co., Cambridge, all in Mass.

2,182,168. **Vulcanizer.** J. M. Bierer, Waban, assignor to Boston Woven Hose & Rubber Co., Cambridge, both in Mass.

2,182,176. **Tire Building Drum.** H. F. Maranville, assignor to General Tire & Rubber Co., both of Akron, O.

2,182,317. **Vulcanizer.** T. M. Knowland, Belmont, assignor to Boston Woven Hose & Rubber Co., Cambridge, both in Mass.

2,182,833. **Press.** E. M. Winegar, assignor to Ohio Rubber Co., both of Willoughby, O.

2,182,900. **Mill.** E. J. McIlvried, Akron, and N. H. Nye, assignors to Vaughn Machinery Co., both of Cuyahoga Falls, both in O.

2,182,905. **Crating Machine.** H. D. Stevens, assignor, by mesne assignments, to Firestone Tire & Rubber Co., both of Akron, O.

2,183,373. **Apparatus to Shape Fastener Elements.** E. J. Tuttle, Waterbury, Conn., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.

2,183,376. **Tread Slitter.** G. F. Wikle, Detroit, Mich., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.

2,183,508. **Machine to Shape Mat Ends.** E. J. Scott, Somerville, assignor to Boston Woven Hose & Rubber Co., Cambridge, both in Mass.

Dominion of Canada

384,576. **Tire Building Apparatus.** Wingfoot Corp., Wilmington, Del., assignee of J. I. Haase, Akron, O., both in the U. S. A.

385,294. **Dipping Form.** A. N. Spanel, Rochester, N. Y., U. S. A.

Germany

682,555. **Device and Method of Making Rubber Heels, Plates, Etc. Deutsche Dunlop Gummi** Co. A.G., Hanau, Main.

683,567. **Stirrer.** Gummiwarenfabrik Pongs & Co., vorm. Gummiwarenfabrik Saul, Aachen.

683,712. **Thread Covering Apparatus.** Plutte, Koecke & Co., Wuppertal-Barmen.

PROCESS

United States

21,269. **(Reissue). Coating Knit Articles.** L. G. Copeman, Lapeer, assignor to Copeman Laboratories Co., Flint, both in Mich.

2,180,650. **Tire.** D. E. White, Silver Spring, Md.

2,180,725. **Cellular Rubber Goods. (Latex.)** A. N. Ward, Bordesley Green, and F. T. Purkis, Moseley, both of Birmingham, assignors to Dunlop Rubber Co., Ltd., London, both in England.

2,181,247. **Gloves.** (Latex.) E. E. Montgomery, assignor to Edmont Mfg. Co., both of Coshocton, O.

2,181,299. **Battery Separator.** (Latex.) W. J. Burgess, Palmyra, N. J., assignor to Electric Storage Battery Co., Philadelphia, Pa.

2,181,379. **Soles.** (Latex.) A. L. Murray, Auburn, Ind.

2,181,538. **Rubberizing Fabrics. J. I. Taylor,** Elizabethton, Tenn., assignor to North American Rayon Corp., New York, N. Y.

2,181,887. **Sausage Casings.** (Latex.) L. A. Goodman, Brooklyn, assignor of one-half to Marcleph & Co., Inc., New York, N. Y.

2,182,169. **Belt Cover Splicing. J. M. Bierer,** Waban, assignor to Boston Woven Hose & Rubber Co., Cambridge, both in Mass.

2,182,456. **Chlorinated Rubber.** W. H. Stevenson, Parlin, N. J., assignor to Hercules Powder Co., Wilmington, Del.

2,182,461. **V-Belt.** W. M. Yeakel, Philadelphia, Pa.

2,182,473. **Increasing Apparent Density of Chlorinated Rubber.** W. E. Gloor, Highland Park, N. J., assignor to Hercules Powder Co., Wilmington, Del.

2,182,996. **Fabrics Using Rubber Threads.** T. L. Shepherd, London, England.

Dominion of Canada

385,360. **Roller.** L. V. Casto, Detroit, Mich., and G. von Webern and E. W. Hamant, both of Dayton, O., co-inventors, both in the U. S. A.

385,060. **Cellular and Spongy Articles.** J. A. Talalay, Bedford, England.

385,338. **Tire.** Firestone Tire & Rubber Co. of Canada, Ltd., Hamilton, Ont., assignee of C. G. Hoover, Akron, O., U. S. A.

385,339. **Tire.** Firestone Tire & Rubber Co. of Canada, Ltd., Hamilton, Ont., assignee of J. E. Hale, Akron, O., U. S. A.

385,477. **Rubber Chloride.** Raolin Corp., assignee of M. R. North, both of Charleston, W. Va., U. S. A., administratrix of the estate of C. O. North, deceased, in his lifetime of Charleston, W. Va., U. S. A.

385,561. **Electric Conductor.** W. C. Robinson, Sewickley, Pa., U. S. A.

Germany

682,883. **Suspender Tabs.** Firma Hch. Kalbskopf, Munchberg, Bayr. Ostmark.

683,790. **Elastic Fabric. T. L. Shepherd,** Portslade, Sussex, England. Represented by F. During and H. Boeters, both of Berlin.

CHEMICAL

United States

2,180,367. **Mixture of Rubber and Unsaturated Hdrocarbon Compounds of Formula** $(C_5H_8)n$. **F. Rostler and V. Mehner,** assignors to Nattolen-Gesellschaft zur Verwertung der Rostler, Mehner'schen Verfahren m. b. H., all of Vienna, Germany.

2,180,666. **Antioxidant**—Reaction Product of a Primary Aromatic Amine and a Saturated Monohydrin Aliphatic Hydrocarbon Alcohol. A. M. Clifford, Stow, O., assignor to Wingfoot Corp., Wilmington, Del.

2,180,906. **Rubber-Fiber Compound with Oily Lubricant.** F. J. and F. J. Maywald, Jr., both of Rutherford, N. J.; **E. A. Maywald, executrix** of said F. J. Maywald, deceased, assignors to Maywald-Fleming Patents Co., a corporation of N. J.

2,180,936. **Antioxidant**—Reaction Product of a Terpene Hydrocarbon and an Aryl Amine. R. F. Dunbrook, assignor to Firestone Tire & Rubber Co., both of Akron, O.

2,181,217. **Parasiticide.** W. P. **Ter Horst, Packanack Lake,** N. J., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.

2,181,426. **Rubber Mixture Comprising Raw Rubber and an Aqueous Emulsion of a Higher Fatty Alcohol.** G. Goll and E. Helft, both of Berlin, assignors, by direct and mesne assignments, to Deutsche Hydrierwerke A.G., Berlin-Charlottenburg, both in Germany.

2,181,454. **Accelerator**—Reaction Product of an Aliphatic Amine and an Aliphatic Aldehyde. H. M. Guinot, Niort, Deuz-Sevres, assignor to Les Usines de Melle, Melle, both in France.

2,181,719. **Antioxidant**—1:3:2-Xylenol with a Methyl Group Having a Substituted Amino Radical. W. Baird and M. Jones, both of Blackley, Manchester, England, assignors to Imperial Chemical Industries, Ltd., a corporation of Great Britain.

2,181,835. **Graphite-Latex Composition for Coating Threads of Metal Screws.** C. E. S. Place, assignor to C. L. Brackett, both of Detroit.

2,182,180. **Reaction Product of Rubber and a Fatty Acid.** A. W. Ralston and W. M. Selby, assignors to Armour & Co., all of Chicago, Ill.

2,183,342. **Plasticizing Rubber with Alpha-nitroso-beta-naphthol.** I. Williams, Woodstown, and C. C. Smith, Carneys Point, both in N. J., assignors to **E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.**

Dominion of Canada

385,086. **Accelerator**—Reaction Product of Diethyl Amine, Oleic Acid, and Carbon Bisulphide. Dunlop Tire & Rubber Corp., assignee of C. O. Miserentino, both of Buffalo, N. Y., U. S. A.

385,087. **Accelerator**—Reaction Product of a Mono-basic Organic Acid, a Secondary Amine, and Carbon Bisulphide. Dunlop Tire & Rubber Corp., assignee of C. O. Miserentino, both of Buffalo, N. Y., U. S. A.

385,213. **Rubber Composition Containing Heat-Reactive Resins.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of H. H. Harkins, North Providence, R. I., U. S. A.

385,478. **Modified Rubber Chloride.** Raolin Corp., Charleston, W. Va., assignee of J. W. Raynolds, Pittsburgh, Pa., both in the U. S. A.

385,479. **Solvated Rubber Chloride.** Raolin Corp., Charleston, W. Va., assignee of J. W. Raynolds, Pittsburgh, Pa., both in the U. S. A.

385,480. **Purified Rubber Chloride for Varnish.** Raolin Corp., Charleston, W. Va., assignee of J. W. Raynolds, Pittsburgh, Pa., both in the U. S. A.

385,638. **Latex Stabilized for Impregnation.** Raybestos-Manhattan, Inc., Bridgeport, assignee of I. J. Novak, Trumbull, both in Conn., U. S. A.

385,648. **Rubber Reaction Product for Dewaxing Oil.** Texaco Development Corp., Wilmington, Del., assignee of L. W. Cook and C. C. Towne, co-inventors, both of Beacon, N. Y., both in the U. S. A.

385,657. **Rubber and Shellac Composition.** W. Zinsser & Co., Inc., assignee of C. R. Haynes and W. R. Clayton, all of New York, N. Y., and R. V. Townsend, Arlington, N. J., co-inventors, both in the U. S. A.

Germany

680,985. **Rubber-like Condensation Products from Aqueous Solutions of Polysulphides of Alkali Metals or Earth Alkali Metals and Low Molecular Paraffin-Dihalogenides. I. G.** Farbenindustrie A.G., Frankfurt a.M.

682,347. **Preventing Formation of Skin on Latex Foam in Molds.** J. A. Talalay, Bedford, England. Represented by F. Quade, Berlin-Zehlendorf.

GENERAL

United States

2,180,346. **Waist Band.** H. Brewster, New York, N. Y.

2,180,390 and 2,180,391. **Undergarment.** D. Blair, Chicago, Ill.

2,180,415. **Combination Storm Sash and Screen Frame.** A. L. Herrmann, Detroit, Mich.

2,180,471. **Wheel.** J. J. R. Johnson, Mumford, N. Y.

2,180,613. **Elastic Mounting.** F. Schmidt, Harburg-Wilhelmsburg, Germany.

2,180,649. **Tire.** D. E. White, Silver Spring, Md.

2,180,676. **Bowling Pin.** I. E. Guimond, Kankakee, Ill.

2,180,858. **Flexible Strip Material Dispenser.** J. R. Bedell, Cuyahoga Falls, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,180,860. **Vehicle Suspension.** R. W. Brown, assignor to Firestone Tire & Rubber Co., both of Akron, O.

2,180,876. **Vehicle Suspension.** J. W. Kuhn, assignor to Firestone Tire & Rubber Co., both of Akron, O.

2,180,886. **Sealing Strip.** C. C. Thomas, assignor, by mesne assignments, to Nash-Kelvinator Corp., both of Detroit, Mich.

2,180,924. **Footwear.** E. W. Dunbar, Hudson, assignor to Cambridge Rubber Co., Cambridge, both in Mass.

2,180,960. **Nipple.** B. H. Kennedy, Pittsford, N. Y.

2,181,066. **Windshield Wiper.** R. C. Rau, Jamaica Plain, Mass.

2,181,086. **Hose Grip and Protector.** J. H. Bohrer, assignor to Continental Rubber Works, both of Erie, Pa.

2,181,106. **Hat Covering.** G. and C. M. Timmons, assignors to Rain Topper Corp., both of Memphis, Tenn.

2,181,160. **Chlorinated Rubber Sheet Material. F. K. Shankweiler,** Newport, assignor to Hercules Powder Co., Wilmington, both in Del.

2,181,256. **Core for Electrodepositing Pipe Couplings.** A. C. Arbogast, assignor to Northern Indiana Brass Co., both of Elkhart, Ind.

2,181,318. **Machine Driving and Stopping Mechanism.** E. E. Fessenden, Jr., Kingston, N. Y.

2,181,350. **Golf Ball.** R. F. Smith, assignor to L. A. Young, both of Detroit, Mich.

2,181,377. **Road Tracks.** H. C. Mabie, Jamaica Plain, Mass.

2,181,382. **Printing Apparatus.** C. F. Schlecht, Chicago, Ill.

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* As no United Kingdom patents have been received from England since our last issue, their publication here has been discontinued.

2,181,475. **Tire Bead Cable.** P. M. Bourdon, Paris, assignor to Michelin & Cie, Clermont-Ferrand, both in France.
2,181,517. **Garment.** M. London, Fort Wayne, Ind.
2,181,522. **Arch Supporting Pad.** L. Rosenthal, Atlantic City, N. J.
2,181,570. **Trolley Base.** E. H. Piron, assignor to Transit Research Corp., New York, N. Y.
2,181,607. **Condenser.** J. A. Poitras, Fort Lee, N. J., assignor to Solar Mfg. Corp., New York, N. Y.
2,181,632. **Insulated Wire.** H. A. Winkelmann, assignor to Marbon Corp., both of Chicago, Ill.
2,181,694. **Tooth Mold.** F. R. Felcher, Chicago, Ill.
2,181,796. **Key-Retainer Identification Tag.** H. V. Williams, Jr., assignor to B. F. Goodrich Co., both of New York, N. Y.
2,181,886. **Sausage Casing.** L. A. Goodman, Brooklyn, assignor of one-half to Marcleph & Co., Inc., New York, both in N. Y.
2,181,891. **Battery Separator.** E. Hazell, assignor, by mesne assignments, to United States Rubber Co., both of New York, N. Y.
2,181,908. **Shear Mounting.** W. H. Mussey, assignor to Pullman-Standard Car Mfg. Co., both of Chicago, Ill.
2,182,022. **Shoe Cover.** S. M. Griswold, assignor to B. B. Chemical Co., both of Boston, Mass.
2,182,040. **Waterproof Container.** R. J. Swanson, Chicago, Ill.
2,182,052 and 2,182,053. **Ball.** M. B. Reach, Springfield, Mass.
2,182,085. **Automobile Bumper Shock Absorber.** J. E. and E. Kellner, both of Chicago, Ill.
2,182,141. **Typewriter Platen.** A. E. Vickery, Bridgeport, Conn., assignors to Remington Rand, Inc., Buffalo, N. Y.
2,182,161. **Fan.** P. Nielsen, assignor to Jubilee Mfg. Co., both of Omaha, Nebr.
2,182,256. **Shoe Cover.** S. M. Griswold, assignor to B. B. Chemical Co., both of Boston, Mass.
2,182,492. **Battery Container Closure.** C. R. Hall, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.
2,182,500. **Battery Cell Cover Assembly.** G. A. Paddock, Stow, O., assignor to B. F. Goodrich Co., New York, N. Y.
2,182,565. **Vacuum Cleaner Handle.** G. E. Lofgren, Riverside, Conn., assignor to Electrolux Corp., Dover, Del.
2,182,579. **Wood Floor Flexible Support.** J. F. Bolton and A. Birch, both of Bolton, England.
2,182,667. **Cable.** F. R. Kaimer, York, Pa., assignor to General Electric Co., a corporation of N. Y.
2,182,702. **Catamenial Article.** R. M. Previn, Washington, D. C.
2,182,848. **Corset.** J. J. Kispert, Hamden, Conn.
2,182,892. **Rotating Seal.** E. H. Fors, St. Albans, England, assignor to Morgan Construction Co., Worcester, Mass.
2,182,895. **Tire Deflation Indicator.** E. C. Henderson, Paso Robles, Calif.
2,182,969. **Device for Discharging Sand.** J. F. Madigan, assignor of one-third to M. Stans and one-third to F. R. Beane, Chicago, Ill.
2,182,981. **Shaft Seal.** W. H. and R. W. Drost, both of Portland, Oreg.
2,183,059. **Fish Lure.** S. E. Bacon, Seattle, Wash.
2,183,076. **Ankle Joint.** W. F. Kaiser, assignor to J. Spievak, both of Youngstown, O.
2,183,077. **Sheet Feeding Apparatus.** E. R. Kast, assignor to Dexter Folder Co., both of Pearl River, N. Y.
2,183,089. **Tire Pressure Signal.** S. G. Bond, Wichita, Kan.
2,183,108. **Fabric.** P. Schönfeld, Chemnitz, Germany.
2,183,157. **Sluice Box Riffle.** P. Swedman, Seattle, Wash.
2,183,218. **Heel.** B. T. Hewson, No. Kensington, London, England.
2,183,257. **Garment Band.** H. Hardie and J. F. Hargreaves, assignors to Faultless Mfg. Co., all of Baltimore, Md.
2,183,277. **Shoe.** E. C. Heilbecker, Bristol, R. I.
2,183,321. **Antiskid Device.** W. C. Jackson, Rahway, N. J., assignor to Tingley Reliance Rubber Corp., a corporation of N. J.
2,183,322. **Holding Strap for Antiskid Device.** W. C. Jackson, Rahway, N. J., assignor to Tingley Reliance Rubber Corp., a corporation of N. J.
2,183,380. **Bathing Garment.** V. H. Hurt, Providence, R. I., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.

Dominion of Canada

384,921. **Heel.** E. Borman, Chicago, Ill., U. S. A.
384,922. **Hot Water Bottle.** J. R. Buchanan, Manchester, England.
385,085. **Sand-Blasting Stencil Sheet.** E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., assignee of A. J. Jennings, Bridgeport, Conn., both in the U. S. A.
385,096. **Aircraft Protective Surface.** B. F. Goodrich Co., New York, N. Y., assignee of R. A. Crawford, Akron, O.
385,161. **Drilling Tool Shank.** W. Dunstan, Johannesburg, Transvaal, South Africa.
385,165. **Corset.** M. L. Jacks, London, England.
385,166. **Window and Storm Sash.** E. Jans, Didsbury, Alberta, Canada.
385,178. **Amusement Device.** L. H. Smith, Myrtle Beach, S. C., U. S. A.
385,212. **Belt.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of B. H. Foster, Maplewood, N. J., U. S. A.
385,282. **Dispensing Box.** M. P. Kennedy, London, Ont.
385,288. **Clasp.** W. E. Olmstead, Bridgeport, Conn., U. S. A.
385,297. **Fan.** L. Zaiger, Lynn, Mass., U. S. A.
385,368. **Leather Cleaning and Dressing Device.** Tolman-Innes, Ltd., assignee of H. E. Tolman, both of Burlington, Ont.
385,375. **Garment Protector.** E. Aubry, inventor, and N. Simoneau, assignee of one-half of the interest, both of Montreal, P. Q.
385,381. **Fabric Length Altering Apparatus.** Cluett, Peabody & Co., Inc., Troy, N. Y., U. S. A., assignee of J. H. Wrigley, Worthington, and A. Melville, Standish, co-inventors, both in England.
385,382. **Fabric Shrinking and Stretching Mechanism.** Cluett, Peabody & Co., Inc., Troy, N. Y., U. S. A., assignee of J. H. Wrigley, Worthington, and A. Melville, Standish, co-inventors, both in England.
385,406. **Footwear.** J. B. Greider, Racine, Wis., U. S. A.
385,530. **Suspensory.** J. J. Cartledge, Guelph, Ont.
385,541. **Case for Cleaner and Shoe Dressing.** A. D. Holder, Newtonbrook, Ont.
385,560. **Reflector Device.** O. C. Ritz-Woller, Chicago, Ill., U. S. A.
385,570. **Knee Pad.** D. F. Turner, Detroit, Mich., U. S. A.
385,628. **Joint Sealing.** Lock Joint Pipe Co., E. Orange, assignee of W. W. Trickey, Verona, both in N. J., U. S. A.
385,647. **Gearing Sleeve.** J. Stone & Co., Ltd., Deptford, assignee of E. C. Hatcher, Northwood, both in England.

Germany

682,506. **Fountain Pen.** Osmia Füllhalter-Fabrik G.m.b.H., Heidelberg-Dossenheim.
682,570. **Saddle Cover.** Framo-Werke G.m.b.H., Hainichen, Saxony.
683,989. **Gas Tube.** Ungarische Gummiwaarenfabriks A.G., Budapest, Hungary. Represented by J. Reitstotter, Berlin.

TRADE MARKS

United States

372,912. **Insolex.** Insulating compound. Hercules Powder Co., Wilmington, Del.
372,991. **Athlete Builders.** Footwear. La Crosse Rubber Mills Co., La Crosse, Wis.
373,041. **Lewella.** Corsets, girdles, etc. Lewel Mfg. Co., Inc., New York, N. Y.
373,055. **Tuffies.** Heels. I. T. S. Co., Elyria, O.
373,186. Representation of a double circle containing the word: **"Willard."** Storage batteries and parts. Willard Storage Battery Co., Cleveland, O.
373,194. **Liliputian Print.** Pads for furniture and scales and bedspreads, quilts, and carriage covers. Best & Co., Inc., New York.
373,205. **Fastop.** Tires. W. E. Trull, Boston, Mass.
373,213. **Magic Floating Belt J. L. J.** Swimming devices. J. L. Jackich, Bend, Ore.
373,236. **2 in 1.** Tires. General Tire & Rubber Co., Akron, O.
373,300. Representation of a label containing the word: **"Keystone."** Tires and tubes. Toledo Tire Corp., Toledo, O.
373,311. **Venus.** Fountain pens, erasers, etc. American Lead Pencil Co., Hoboken, N. J.
373,413. **Fash-N-Form.** Suspenders and garters. National Shirt Shops of Delaware, Inc., New York, N. Y.
373,460. Representation of a heart-shaped figure appearing as a cut-away of the rubber tread of a tire. Tires. Dayton Rubber Mfg. Co., Dayton, O.
373,465. **Kleinert's Thrift.** Dress shields. I. B. Kleinert Rubber Co., New York, N. Y.
373,486. **La-ce-lastic Every Inch a Real Lace.** Elastic braids. Narrow Fabric Co., Reading, Pa.
373,565. Representation of an oval containing the word: **"Du Pont."** Neoprene. E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
373,566. Representation of an oval containing the word: **"Du Pont."** Neoprene-coated fabrics, sponge rubber rug cushions, etc. E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
373,569. **Liliputian Print.** Children's wear. Best & Co., Inc., New York, N. Y.
373,644. **French Fashions by Franco.** Foundations, girdles, etc. Franco Corset Co., New York, N. Y.

New York Group

(*Continued from page* 51)

& Co., Inc., Endicott Johnson Corp., Farrel-Birmingham Co., Inc., Flintkote Corp., General Atlas Carbon Co., Givaudan-Delawanna, Inc., C. P. Hall Co., J. M. Huber, Inc., Imperial Paper & Color Corp., INDIA RUBBER WORLD, Monsanto Chemical Co. (Rubber Service Dept.), H. Muehlstein & Co., Inc., National Rubber Machinery Co., National Sherardizing & Machine Co., Naugatuck Chemical, New Jersey Zinc Co., Pequanoc Rubber Co., Philadelphia Rubber Works Co., Rare Metal Products, Revertex Corp. of America, *Rubber Age*, St. Joseph Lead Co., A. Schulman, Inc., Henry L. Scott Co., Somerset Rubber Reclaiming Works, Southwark Mfg. Co., Speed Products Co., Stamford Rubber Supply Co., C. J. Tagliabue Mfg. Co., Thiokol Corp., Thompson, Weinman & Co., Inc., Titanium Pigment Corp., United Carbon, R. T. Vanderbilt Co., Inc., Vansul, Inc., and Wishnick-Tumpeer, Inc.

Chicago Group Plays Host to Ladies

WITH the entire evening devoted to social activities the Chicago Group, Rubber Division, A. C. S., held its annual Christmas Party and Ladies' Night on December 15, at the Ivanhoe Gardens, Chicago, Ill. Over 220 members and their ladies were present. Each lady received a gift; while door prizes were provided for the men.

All of the gifts and extra refreshments were provided for by the following concerns: Akron Standard Mold Co., L. Albert & Son, American Zinc Sales Co., Binney & Smith Co., Godfrey L. Cabot, Inc., The Carter Bell Mfg. Co., Commerce Petroleum Co., Continental Carbon Co., The Cleveland Liner & Mfg. Co., E. I. du Pont de Nemours & Co., Inc., General Atlas Carbon Co., Genseke Bros. Soap Co., Herron & Meyer, J. M. Huber, Inc., International Smelting & Refining Co., Loeb Equipment Supply Co., H. Muehlstein & Co., Inc., Midwest Rubber Reclaiming Co., Monsanto Chemical Co., New Jersey Zinc Co., Naugatuck Chemical Division of United States Rubber Co., Philadelphia Rubber Works, Thiokol Corp., A. Schulman, Inc., United Carbon Co., Van Cleef Bros., R. T. Vanderbilt Co., Inc., and Wishnick-Tumpeer, Inc.

Detroit Section Elects

THE Detroit Section, A. C. S., elected the following officers for 1940: chairman, H. M. Merker, Parke, Davis & Co.; chairman-elect, O. E. Kurt, Ethyl Gasoline Corp.; secretary, A. W. Oakleaf, United States Rubber Co.; treasurer, R. D. Hummel, Parke, Davis; councilors, A. W. Bull, U. S. Rubber, G. Calingaert, Ethyl Gasoline, J. J. Jasper, Wayne University, and A. Rautenberg, Champion Spark Plug Co.

Market Reviews

CRUDE RUBBER

Commodity Exchange

TABULATED WEEK-END CLOSING PRICES OF THE NEW YORK MARKET

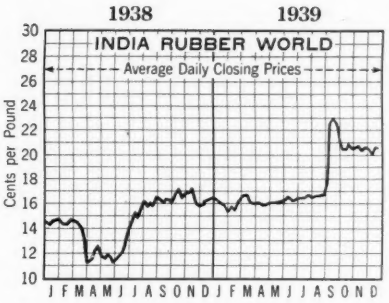
Futures	Oct. 28	Nov. 25	Dec. 2	Dec. 9	Dec. 16	Dec. 23
Nov.	19.65	20.35	.....	.....	.....	.....
Dec.	19.65	20.35	20.03	19.75	20.30	20.64
Jan.	.....	.....	19.30	19.20	19.60	19.35
Mar.	18.55	19.43	18.79	18.76	19.40	19.10
July	18.05	18.35	17.85	18.03	18.85	18.65
Sept.	18.05	18.05	17.65	17.90	18.70	18.43
Oct.	.....	18.05	17.65	17.90	18.70	18.43
Volume per week (tons) ..	5,350	4,980	7,920	5,380	11,920	5,270

THE rubber market weakened somewhat during the first week of December, then regained strength to reach higher levels later in the month. Chief factors in the mid-month advance were fears of a tight supply situation for spot and nearby deliveries, the sinking of more ships, and the dispelling of fears that rubber prices in England were to be fixed officially.

After closing at 18.78¢ per pound on December 1, March futures dropped to 18.60¢ per pound on December 7, advanced sharply to reach 19.60¢ on December 14, and then eased off somewhat to close at 19.13¢ on December 20.

Thereafter the market was easier, and the closing price on December 29 was 18.94¢ per pound. The tightness in the December position became somewhat relieved during the month with the spread between this month and March reduced to 88 points on December 19. Trading during the month was light. Certified rubber stocks in licensed Commodity Exchange, Inc., warehouses reached a new low of 1,710 tons on December 4.

As predicted here last month, U. S. consumption in November, 54,322 long tons, was only slightly under the record breaking October figure of 55,764 tons. It is expected that December consumption, which is being well-maintained, will be about 50,000 tons. Should this figure be reached, 1939 rubber consumption will be approximately 579,000 tons and exceed the record consumption figure of 1936, which was 575,000 tons. United States stocks at the end of November decreased to 2.2 months' supply, at the close of October.



New York Outside Market—Spot Ribbed Smoked Sheets

From the end of August afloats to this country have increased markedly from 66,717 tons to the record high of 114,044 tons at the end of November. However importations into the United States have shown no great increase. This condition indicates a substantial backlog, probably resulting from the lengthening of the in-transit period since the start of the war. The increase of in-transit period necessarily requires increased exports to take care of the backlog until it is stabilized under present shipping conditions. With stocks in this country dangerously low, the supply situation may be seriously affected unless sufficient shipments are made to take care of this backlog plus consumption. As a result of large overshipments from agreement countries during the first 10 months of 1939, export figures from producing countries during November dropped off sharply, and indications are that December exports will also be low.

According to the Department of Commerce, reexports of crude rubber from this country during November amounted to 1,228 tons, against 5,886 tons for October and 1,472 tons for September. Reexports in November went to several European markets, as well as to Canada, Mexico, and the usual Latin American markets. Of the 5,886 tons reexported in October, 5,032 tons went to Soviet Russia.

Net imports into the United States during November amounted to 41,358 long tons, which is well above the average of 37,459 tons net imports for the first 10 months of 1939 and slightly above the October net of 39,735 tons. Heavier arrivals were anticipated last month.

New York Outside Market

The outside market was moderately active during December; dealers reported a fair amount of business with factories, particularly for January to March shipment. Akron plants showed considerable interest in off-grades of rubber. Offerings from the Far East continued limited and too high. The market held generally firm throughout the month. The price of No. 1 ribbed smoked sheets closed at 20⅜¢ per pound on November 30, and after dropping to 19⅞¢ per pound on December 7, regained strength, closing at 20⅜¢ per pound on December 20. The closing price on December 29 was 19¼¢ per pound with the market easier.

The week-end closing prices on No. 1 ribbed smoked sheets follow: December 2, 20⅜¢; December 9, 20¢; December 16, 20⅝¢; December 23, 20⅝¢; and December 30, 19¼¢.

New York Quotations

New York outside market rubber quotations in cents per pound

	Dec. 28, 1938	Nov. 27, 1939	Dec. 28, 1939
Plantations			
Rubber latex..*gal.*	60/61	80/81	77/78
Paras			
Upriver fine.....	14	18¼	21¼
Upriver fine.....	*17¾	*21¼	*24¾
Upriver coarse ...	9⅞	11	12
Upriver coarse ...	*14	*19	*19
Islands fine.....	13½	18	20
Islands fine.....	*16	*21	*24
Acre, Bolivian fine	14¼	18	21½
Acre, Bolivian fine	*18	*21½	*25
Beni, Bolivian fine	15¼	18½	22
Madeira fine	14	18¼	21¼
Caucho			
Upper ball	9⅞	11	12
Upper ball	*14	*19	*19
Lower ball	9⅜	10	11½
Pontianak			
Pressed block ...	10/16	12/18	12½/18
Guayule			
Ampar	13	15	15
Africans			
Rio Nuñez.....	14	17½	17½
Black Kassai	14	17½	17½
Prime Niger flake	25	25	25
Gutta Percha			
Gutta Siak	11	17	17⅜
Gutta Soh	14	17	23
Red Macassar ...	90/1.20	1.20	1.25
Balata			
Block Ciudad Bolivar	28	35	35
Manaos block ...	28	33	40
Surinam sheets ..	41	40	48
Amber	43	42	50

*Washed and dried crepe. Shipments from Brazil.

New York Outside Market—Spot Closing Prices—Plantation Grades—Cents per Pound

	November, 1939				December, 1939																	
	27	28	29	30	1	2	4	5	6	7	8	9	11	12	13	14	15	16	18	19	20	21	22	23*
No. 1 Ribbed Smoked Sheet.	20¾	20⅝	20⅜	20⅜	20⅜	20⅜	20¼	20¼	20	19⅞	20	20	20¼	20⅝	20¾	20¾	20½	20⅝	20¾	20⅝	20⅜	20¼	20⅝	..
No. 1 Thin Latex Crepe.....	23	22⅞	22⅝	22⅝	22⅝	22⅝	22½	22½	22¼	22⅛	22¼	22¼	22½	22⅞	23	23	22¾	22⅞	23	22⅞	22⅝	22½	22⅞	..
No. 2 Thick Latex Crepe...	21⅞	21¾	21½	21½	21½	21½	21⅜	21⅜	21⅛	21	21⅛	21⅛	21⅜	21¾	21⅞	21⅞	21⅝	21¾	21⅞	21¾	21½	21⅜	21¾	..
No. 1 Brown Crepe.....	19⅝	19½	19¼	19¼	19¾	19¼	19⅛	19⅛	18⅞	18¾	18⅞	18⅞	19⅛	19½	19⅝	19⅝	19⅜	19½	19⅝	19½	19¼	19⅛	19½	..
No. 2 Brown Crepe.....	19⅜	19¼	19	19	19	19	18⅞	18⅞	18⅝	18½	18⅝	18⅝	18⅞	19¼	19⅜	19⅜	19⅛	19¼	19⅜	19¼	19	18⅞	19¼	..
No. 2 Amber.....	19⅝	19½	19¼	19¼	19¼	19¼	19⅛	19⅛	18⅞	18¾	18⅞	18⅞	19⅛	19½	19⅝	19⅝	19⅜	19½	19⅝	19½	19¼	19⅛	19½	..
No. 3 Amber.....	19⅜	19¼	19	19	19	19	18⅞	18⅞	18⅝	18½	18⅝	18⅝	18⅞	19¼	19⅜	19⅜	19⅛	19¼	19⅜	19¼	19	18⅞	19¼	..
Rolled Brown.....	18¾	18⅝	18⅜	18¼	18¼	18¼	18⅛	18⅛	17⅞	17¾	17⅞	17⅞	18⅛	18½	18¼	18¼	18	18⅛	18¼	18⅛	17⅞	17¾	18⅛	..

*Closed.

RECLAIMED RUBBER

ACCORDING to R. M. A. figures, November reclaimed consumption is estimated at 18,006 long tons, 5.1% below that of October; production, 20,755 long tons; and stocks on hand November 30, 22,362 long tons. Demand for reclaim during December was reported as being good, but under that of preceding months. It is anticipated that consumption for the month will be about 16,000 tons. Although conditions are somewhat uncertain, it is generally believed that activity during early 1940 will be well maintained.

The market is steady, with all grades of reclaim continuing unchanged.

New York Quotations

December 21, 1939

	Sp. Grav.	¢ per lb.
Auto Tire		
Black Select	1.16-1.18	6 / 6¼
Acid	1.18-1.22	7 / 7¼
Shoe		
Standard	1.56-1.60	6¼/ 6¾
Tubes		
Red Tube	1.15-1.30	9 / 9¼
Compound	1.10-1.20	9 /10
Miscellaneous		
Mechanical Blends	1.25-1.50	4½/ 5
White	1.35-1.50	12½/14

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

United States Reclaimed Rubber Statistics—Long Tons

Year	Production	Consumption†	Consumption % to Crude	U. S. Stocks*	Exports
1937	185,033	162,000	29.8	28,800	13,233
1938	122,403	120,800	27.6	23,000	7,403
1939					
Jan.	14,826	13,743	29.7	23,334	748
Feb.	14,102	13,347	31.5	23,461	630
Mar.	15,647	16,197	32.3	22,155	756
Apr.	14,527	13,391	30.3	22,628	748
May	14,769	13,517	30.5	22,771	1,008
June	15,871	14,870	31.5	23,058	759
July	12,588	13,542	30.9	21,339	1,036
Aug.	17,595	16,846	33.4	21,024	843
Sept.	17,990	16,953	33.8	21,185	1,265
Oct.	20,896	18,955	34.0	21,829	1,816
Nov.	20,755	18,006	33.1	22,362	...

*Stocks on hand the last of the month or year. †Corrected to 100% from estimate of reported coverage.
Compiled by The Rubber Manufacturers Association, Inc.

IMPORTS, CONSUMPTION, AND STOCKS

CRUDE rubber consumption by United States manufacturers during November is estimated at 54,322 long tons, 2.6% under the 55,764 long tons for October, but 10.7% above the 49,050 (revised) long tons consumed in November, 1938, according to R.M.A. statistics.

Gross imports of crude rubber for November, reported by the Department of Commerce at 42,586 long tons, are 3.2% above the October figure of 41,250 long tons and 37.1% over the 31,054 long tons imported in November, 1938.

The R.M.A. estimates total domestic stocks of crude rubber on hand November 30 at 118,535 long tons, against October 31 stocks of 133,183 long tons and 242,542 (revised) long tons on hand November 30, 1938.

Crude rubber afloat to United States ports as of November 30 is figured to be 114,044 long tons, compared with 100,500 long tons afloat on October 31 and 51,114 long tons afloat on November 30, 1938.

United States and World Statistics of Rubber Imports, Exports, Consumption, and Stocks—Long Tons

Twelve Months	U. S. Imports*	U. S. Consumption‖	U. S. Stocks Mfgrs. Importers, Dealers, Etc.†	U. S. Stocks Afloat†	U. K.—Public Warehouses, London Liverpool†‡	Singapore and Penang Dealers and Port Stocks†‡	World Production (Net Exports)‡	World Consumption Estimated‡	World Stocks†‡‖
1937	584,851	543,600	262,204	63,099	57,785	44,792	1,139,800	1,104,891	646,252
1938	400,178	437,031	231,500	45,105	86,853	27,084	894,940	940,939	596,498
1939									
Jan.	39,082	46,234	223,879	48,210	80,643	30,975	87,497	89,021	585,812
Feb.	36,490	42,365	217,534	55,814	75,517	28,559	77,646	83,857	569,161
Mar.	38,989	50,165	205,936	55,981	72,235	23,255	76,975	95,020	545,840
Apr.	29,601	44,166	190,896	57,918	68,931	22,434	73,820	86,859	519,032
May	47,535	44,377	193,602	54,046	66,020	20,849	70,813	89,264	512,228
June	35,947	47,259	181,794	51,274	63,878	19,563	64,419	90,845	501,218
July	36,739	43,880	174,240	52,990	57,234	27,042	84,386	87,514	497,507a
Aug.	38,045	50,481	161,362	66,717	44,917	20,543	91,993	96,425	478,047a
Sept.	41,939	50,150	150,171	68,310	.....	23,482	87,745	83,879	.....
Oct.	41,250	55,764	133,183	100,500	.....	25,398	114,761	96,642	.....
Nov.	42,586	54,322	118,535	114,044	.....	.....	.....	.....	.....

*Including liquid latex. †Stocks on hand the last of the month or year. ‡Statistical Bulletin of the International Rubber Regulation Committee. §Stocks at U. S. A., U. K., Singapore and Penang, Para, Manaos, regulated areas, and afloat. ‖Corrected to 100% from estimate of reported coverage.
a Not including stocks at French dealers.

RUBBER SCRAP

WITH reclaim production holding at a high level, the demand for scrap rubber last month continued excellent. The volume of scrap collections was said to be fair. Export business is quiet with few bottoms available for shipments. The market is generally steady. Three inner-tube grades and three tire grades receded somewhat in price from last month's quotations, while all other grades held steady and unchanged.

Consumers' Buying Prices

(Carload Lots for December 21, 1939)

		Prices
Boots and Shoes		
Boots and shoes, black	lb.	$0.01¾/$0.01¼
Colored	lb.	.01 / .01¼
Untrimmed arctics	lb.	.01 / .01¼
Inner Tubes		
No. 1, floating	lb.	.11 / .12
No. 2, compound	lb.	.04⅞/ .05
Red	lb.	.04⅝/ .04¾
Mixed tubes	lb.	.04¼/ .04⅜
Tires (Akron District)		
Pneumatic Standard		
Mixed auto tires with beads	ton	14.00 /15.00
Beadless	ton	17.50 /18.50
Auto tire carcass	ton	30.00 /35.00
Black auto peelings	ton	26.00 /27.00
Solid		
Clean mixed truck	ton	32.00 /33.00
Light gravity	ton	42.00 /44.00
Mechanicals		
Mixed black scrap	ton	20.00 /22.00
Hose, air brake	ton	20.00 /22.50
Garden, rubber covered	ton	12.50 /14.00
Steam and water, soft	ton	12.50 /14.00
No. 1 red	lb.	.03 / .03¼
No. 2 red	lb.	.02¼/ .02½
White druggists' sundries	lb.	.03¾/ .04
Mixed mechanicals	lb.	.02¼/ .02½
White mechanicals	lb.	.03⅝/ .03¾
Hard Rubber		
No. 1 hard rubber	lb.	.12 / .13

United States Latex Imports

Year	Pounds (d.r.c.)	Value
1937	51,934,040	$10,213,670
1938	26,606,048	4,147,318
1939		
Jan.	3,589,452	599,927
Feb.	3,844,996	657,565
Mar.	4,491,951	731,302
Apr.	2,279,171	360,739
May	6,240,019	1,067,682
June	4,111,994	694,863
July	6,572,567	1,064,927
Aug.	5,855,400	1,001,013
Sept.	5,656,700	963,615
Oct.	5,724,048	968,207

Data from Leather and Rubber Division.

British Malaya Imports*

From	Dry Rubber Tons —Nov.,	Wet Rubber (Dry Weight) Tons 1939—
Sumatra	5,560	133
Dutch Borneo	2,030	..
Java and other Dutch islands	527	..
Sarawak	1,999	5
British Borneo	462	39
Burma	253	2
Siam	1,245	24
French Indo-China	1,081	166
Other countries	118	8
Totals	13,275	377

*Figures on rubber gross exports: Ocean Shipments from Singapore, Penang, Malacca, and Port Swettenham are being temporarily withheld.

COMPOUNDING INGREDIENTS

THE demand for compounding ingredients during December, while holding up exceptionally well for this time of year, fell off somewhat from the high levels of preceding months. There is evidence of continued favorable demand in the brisk contracting for 1940 delivery of materials. From current indications it is expected that tire manufacturing schedules, both for equipment and replacement purposes, will be well maintained during the early part of 1940. Other lines of rubber manufacture have shown no signs of falling off appreciably.

Prices in general are unchanged with the exception of the stearic acid quotation which declined ½¢ per pound and carbon black schedules for 1940 which are noted below. Contracting for the first quarter of 1940 is now being carried out at unchanged quotations for the following materials: barytes, lithopone, titanium pigments, zinc oxide, domestic talc, whiting, and china clay except in the case of one supplier who has increased this price.

CARBON BLACK. Producers of carbon black have announced price schedules for 1940 which supersede the announcement made here last month. Prices, f.o.b. plant (for rail movement only) are now 2.30¢ per pound in bulk; 2.425¢ for compressed or dustless grades in bags; and 2.55¢ for uncompressed grades in bags. Carbon black in coastwise shipments is now 3.18¢ per pound, f.o.b Hoboken, in bulk; 3.30¢, f.o.b. North Atlantic docks, for compressed and dustless grades in bags; and 3.425¢, f.o.b. North Atlantic docks, for uncompressed in bags. These prices are subject to quarterly revision. December sales were reported to be continuing heavy.

FACTICE OR RUBBER SUBSTITUTE. The demand continued steady, and quotations generally unchanged. With increased costs of imported oils, the market is firm.

LITHARGE. The demand was steady with prices unchanged.

LITHOPONE. Contracting for 1940 was brisk, but spot demand quiet. Prices continue steady.

RUBBER CHEMICALS. The demand for accelerators and antioxidants continued good last month but not at the peak levels of previous months. Prices are generally unchanged.

RUBBER SOLVENTS. There was some slackening in demand from tire manufacturers although consumption was reported as running about 20% ahead of 1938. The price is firm.

TITANIUM PIGMENTS. Market interest centered in 1940 contracting with spot demand substantially under previous months. The price is firm and unchanged.

ZINC OXIDE. Despite a weakness in zinc metal, the price of these oxides continued steady, and contracting for the first quarter of 1940 was carried out at previously quoted levels. Demand from paint manufacturers fell off slightly, but tire manufacturers continued as active buyers.

New York Quotations*

December 22, 1939

Abrasives		
Pumicestone, powdered	lb.	$0.03 /$0.035
Rottenstone, domestic	lb.	.03 / .035
Silica, 15	ton	
Accelerators, Inorganic		
Lime, hydrated, l.c.l., New York	ton	20.00
Litharge (commercial)	lb.	.0675/ .0725
Accelerators, Organic		
A-1	lb.	.24 / .30
A-10	lb.	.31 / .35
A-11	lb.	.52 / .65
A-19	lb.	**.52 / .65**
A-32	lb.	**.70 / .80**
A-77	lb.	.42 / .55
A-100	lb.	.42 / .55
Accelerator 49	lb.	.40 / **.42**
737	lb.	.42 / .43
737-50	lb.	.25 / .26
808	lb.	**.70 / .72**
833	lb.	1.15
Acrin	lb.	.60
Aldehyde ammonia	lb.	**.70**
Altax	lb.	.55 / .65
B-J-F	lb.	.50 / .55
Beutene	lb.	**.70 / .75**
Butyl Eight	lb.	
Zimate	lb.	**2.50**
C-P-B	lb.	2.00
Captax	lb.	.50 / .57
Crylene	lb.	**.40 / .47**
Paste	lb.	**.30 / .36**
D-B-A	lb.	2.00
Delac A	lb.	.40 / .50
O	lb.	.40 / .50
P	lb.	.40 / .50
Di-Esterex-N	lb.	.60 / .70
DOTG (Di-ortho-tolylguanidine)	lb.	$0.44 /$0.46
DPG (Diphenylguanidine)	lb.	.35 / .45
El-Sixty	lb.	.50 / .65
Ethylideneaniline	lb.	**.42 / .43**
Ethyl Zimate	lb.	2.50
Formaldehyde P.A.C.	lb.	.0625
Formaldehydeaniline	lb.	.31
Formaldehyde-para-toluidine	lb.	.52 / .54
Guantal	lb.	.40 / .50
Hepteen	lb.	.35 / .40
Base	lb.	1.35 / 1.50
Hexamethylenetetramine U.S.P.	lb.	.39
Technical	lb.	.33
Lead oleate, No. 999	lb.	.14
Witco	lb.	.15
Monex	lb.	2.35
Novex	lb.	
O. N. V.	lb.	1.00 / 1.10
O-X-A-F	lb.	**.50 / .55**
Ovac	lb.	.50 / .55
Para-nitroso-dimethylaniline	lb.	.85
Pentex	lb.	1.00 / 1.10
Flour	lb.	.15 / .16
Pip-Pip	lb.	2.50
Pipsolene	lb.	1.55 / 1.85
R-2	lb.	1.40 / 1.80
R-23	lb.	.40
R & H 50-D	lb.	.42 / .43
Rotax	lb.	**.60 / .65**
Safex	lb.	**1.20 / 1.30**
Santocure	lb.	.80 / 1.00
Super-sulphur No. 1	lb.	.50
2	lb.	.18 / .25
Tetrone A	lb.	**2.70**
Thiocarbanilide	lb.	.24 / .30
Thionex	lb.	2.35
Thiurad (f.o.b. Nitro, W. Va.)	lb.	2.35
Trimene	lb.	.55 / .65
Base	lb.	**1.05 / 1.20**
Triphenylguanidine (TPG)	lb.	.45
Tuads	lb.	**2.35**
Ureka	lb.	.60 / .75
Blend B	lb.	.60 / .75
C	lb.	.56 / .65
Vulcanex	lb.	$0.42 /$0.43
Vulcanol	lb.	.85
Z-B-X	lb.	2.50
Zenite	lb.	.46 / **.48**
A	lb.	.53 / .55
B	lb.	.46 / **.48**
Zimate	lb.	**2.35**
Activator		
Aero Ac 50	lb.	.46 / **.52**
Barak	lb.	.50
Age Resisters		
AgeRite Alba	lb.	1.50 / 1.95
Exel	lb.	**1.00 / 1.40**
Gel	lb.	.57 / .73
Hipar	lb.	**.65 / .92**
Powder	lb.	.52 / .64
Resin	lb.	.52 / .64
D	lb.	.52 / .64
White	lb.	1.25 / 1.60
Akroflex C	lb.	.56 / .58
Albasan	lb.	**.70 / .75**
Aminox	lb.	.52 / .61
Antox	lb.	.56
B-L-E	lb.	.52 / .61
Powder	lb.	.65 / .74
B-X-A	lb.	**.52 / .61**
Copper Inhibitor X-872-A	lb.	1.15
Flectol B	lb.	.52 / .65
H	lb.	.52 / .65
White	lb.	.90 / 1.15
M-U-F	lb.	1.50
Neozone (standard)	lb.	.63
A	lb.	.52 / .54
B	lb.	.63
C	lb.	.52 / .54
D	lb.	.52 / .54
E	lb.	.63
Oxynone	lb.	.64 / .80
Parazone	lb.	.68
Permalux	lb.	1.20
Santoflex B	lb.	.52 / .65
Solux	lb.	1.30
Thermoflex A	lb.	.65 / .67
Tysonite	lb.	.16 / .21
V-G-B	lb.	.52 / .61
Alkalies		
Caustic soda, flake, Columbia (400 lb. drums)	100 lbs.	**2.70 / 3.55**
liquid, 50%	100 lbs.	1.95
solid (700 lb. drums)	100 lbs.	2.30 / 3.15
Antiscorch Materials		
A-F-B	lb.	.35 / .40
Antiscorch T	lb.	.90
E-S-E-N	lb.	.35 / .40
R-17 Resin (drums)	lb.	.10
RM	lb.	1.25
Retarder W	lb.	.36
U.T.B.	lb.	.35 / .40
Antisun Materials		
Heliozone	lb.	.21
Sunproof	lb.	.20 / .25
Colors		
Black		
Du Pont powder	lb.	.42 / .44
Lampblack (commercial)	lb.	.15
Blue		
Brilliant	lb.	
Du Pont dispersed	lb.	.83 / 3.95
Powders	lb.	**2.25 / 3.75**
Prussian	lb.	
Toners	lb.	.08 / **3.85**
Brown		
Mapico	lb.	.11
Green		
Brilliant	lb.	
Chrome, light	lb.	
medium	lb.	.22
oxide (freight allowed)	lb.	
Dark	lb.	
Du Pont dispersed	lb.	**.98 / 1.75**
Powders	lb.	1.00 / 5.50
Guignet's, Easton, Pa., bbls.	lb.	.70
Light	lb.	
Toners	lb.	**.85 / 3.75**
Orange		
Du Pont dispersed	lb.	.88 / .98
Powders	lb.	.88 / 2.75
Lake	lb.	
Toners	lb.	**.40 / 1.60**
Orchid		
Toners	lb.	**1.50 / 2.00**
Pink		
Toners	lb.	**1.50 / 2.00**
Purple		
Permanent	lb.	
Toners	lb.	.60 / **2.10**
Red		
Antimony Crimson, 15/17%	lb.	
R. M. P. No. 3	lb.	.48
Sulphur free	lb.	
R.M.P.	lb.	.52
Golden 15/17%	lb.	
7-A	lb.	.37
Z-2	lb.	.23
Aristi	lb.	

*Prices not recorded will be supplied on application.

Cadmium, light (400 lb. bbls.)	lb.	$0.80	/$0.90
Chinese	lb.		
Crimson	lb.		
Du Pont dispersed	lb.	.93	/ 2.05
Powders	lb.	.285	/ 1.05
Mapico	lb.	.0925	
Medium	lb.		
Rub-Er-Red. Easton, Pa., bbls.	lb.	.0925	
Scarlet	lb.		
Toners	lb.	.08	/ 2.00

White

Lithopone (bags)	lb.	.0375/	.04
Albalith Black Label-11	lb.	.0375/	.04
Astrolith	lb.	.0375/	.04
Azolith	lb.	.0375/	.04
Cryptone-BA-19	lb.	.0525/	.055
BT	lb.	.0525/	.055
CB	lb.	.0525/	.055
ZS No. 20	lb.	.075 /	.0775
86	lb.	.075 /	.0775
230	lb.	.075 /	.0775
Sunolith	lb.	.0375/	.04
Ray-Bar	lb.	.0525/	.0575
Ray-Cal	lb.	.0525/	.0575
Rayox	lb.	.13 /	.14
Titanolith (5-ton lots)	lb.	.0525/	.055
Titanox-A (50-lb. bags)	lb.	.1375	
B (50-lb. bags)	lb.	.055	
30 (50-lb. bags)	lb.	.055	
C (50-lb. bags)	lb.	.0525	
M (50-lb. bags)	lb.	.055	
Ti-Tone	lb.		
Zinc Oxide			
Azo ZZZ-11	lb.	.0625/	.065
44	lb.	.0625/	.065
55	lb.	.0625/	.065
66	lb.	.0625/	.065
French Process, Florence			
White Seal-7 (bbls.)	lb.	.085 /	.0875
Green Seal-8	lb.	.08 /	.0825
Red Seal-9	lb.	.075 /	.0775
Kadox, Black Label-15	lb.	.065 /	.0675
No. 25	lb.	.075 /	.0775
Red Label-17	lb.	.065 /	.0675
Horse Head Special 3	lb.	.0625/	.065
XX Red-4	lb.	.0625/	.065
23	lb.	.0625/	.065
72	lb.	.0625/	.065
78	lb.	.0625/	.065
80	lb.	.0625/	.065
103	lb.	.0625/	.065
110	lb.	.0625/	.065
St. Joe (lead free)			
Black Label	lb.	.0625/	.065
Green Label	lb.	.0625/	.065
Red Label	lb.	.0625/	.065
U.S.P.	lb.	.095 /	.0975
White Jack	lb.	.075 /	.0775
Zopaque	lb.	.13 /	.1375

Yellow

Cadmolith (cadmium yellow), 400 lb. bbls.	lb.	.55 /	.65
Du Pont dispersed	lb.	1.25 /	1.75
Powders	lb.	.135 /	2.75
Lemon	lb.		
Mapico	lb.	.0675	
Toners	lb.	2.50	

Dispersing Agents

Darvan	lb.	.30 /	.47
Nevoll (drums, carlot)	lb.	.0245	
Santomerse S	lb.	.11 /	.25

Fillers, Inert

Asbestine, c.l., f.o.b., mills	ton	15.00	
Barytes	ton	30.00	/36.00
f.o.b., St. Louis (50 lb. paper bags)	ton	22.85	
off color, domestic	ton	20.00	/25.00
white, imported	ton	29.00	/32.00
Blanc fixe, dry, precip.	lb.	.03 /	.035
Calcene	ton	37.50	/43.00
Infusorial earth	lb.	.02 /	.03
Kalite No. 1	ton	24.00	/50.00
3	ton	34.00	/60.00
Magnesia, calcined, heavy	lb.	.04	
Carbonate, l.c.l.	lb.	.07 /	.095
Pyrax A	ton	6.00	/20.00
Whiting			
Columbia Filler	ton	9.00	/14.00
Guilders	100 lbs.		
Paris white, English cliff-stone	100 lbs.		
Southwark Brand, Commercial	100 lbs.		
All other grades	100 lbs.		
Suprex, white extra light	ton	45.00	
heavy	ton	45.00	
Witco, c.l.	ton	6.00	

Finishes

Rubber lacquer, clear	gal.		
colored	gal.		
Starch, corn, pwd.	100 lbs.		
potato	lb.		
Talc	ton	25.00	/45.00

Flock

Cotton flock, dark	lb.	$0.10	/$0.12
dyed	lb.	.40 /	.80
white	lb.	.11 /	.19
Rayon flock, colored	lb	1.00 /	1.50
white	lb.	.75 /	1.00

Latex Compounding Ingredients

Accelerator 85	lb.	.35	
89	lb.	1.40	
122	lb.	1.55	
552	lb.	2.50	
Aerosol OT Aqueous 10%	lb.	.15 /	.25
Antox, dispersed	lb.	.42	
Aquarex A	lb.	.35	
D	lb.	.75	
F	lb.	.85	
WA Paste	lb.	.28	
Areskap No. 50	lb.	.18 /	.24
100, dry	lb.	.39 /	.51
Aresket No. 240	lb.	.16 /	.22
300, dry	lb.	.42 /	.50
Aresklene No. 375	lb.	.35 /	.50
400, dry	lb.	.51 /	.65
Black No. 25, dispersed	lb.	.22 /	.40
Catalpo	ton		
Collocarb	lb.	.055 /	.07
Color Pastes, dispersed	lb.	.35 /	1.90
Dispersex No. 15	lb.	.11 /	.12
No. 20	lb.	.08 /	.10
Emo, brown	lb.	.15	
white	lb.	.15	
Factice Compound, dispersed	lb.	.36	
Heliozone, dispersed	lb.	.25	
Igepon A	lb.		
MICRONEX, Colloidal	lb.	.055 /	.07
Nekal BX (dry)	lb.		
Palmol	lb.	.13	
Pipsol X	lb.	3.05 /	3.55
R-2 Crystals	lb.	2.50 /	2.75
R-23	lb.	.40	
R-N-2	lb.	1.40 /	1.80
Crystals	lb.	2.00 /	2.25
S.1 (400 lb. drums)	lb.	.65	
Santobrite	lb.		
Santomerse D	lb.	.41 /	.65
S	lb.	.11 /	.25
No. 1	lb.	.18 /	.35
No. 2	lb.	.18 /	.35
No. 3	lb.	.40 /	.65
No. 3P	lb.	.20 /	.45
Santovar A	lb.	1.15 /	1.40
Stablex A	lb.	.90 /	1.10
B	lb.	.65 /	.90
C	lb.	.40 /	.50
Sulphur, dispersed	lb.	.10 /	.15
No. 2	lb.	.075 /	.15
T.1 (400 lb. drums)	lb.	.40	
Tenidone	lb.	1.45	
Vulcan Colors	lb.		
Zinc oxide, dispersed	lb.	.12 /	.15

Mineral Rubber

Black Diamond	ton	25.00	
Hydrocarbon, hard	ton	21.00	/42.00
Parmr	ton	21.00	/25.00
Pioneer	ton		
285°-300°	ton	21.00	/42.00

Mold Lubricants

Mold Paste	lb.	.12 /	.18
Sericite	ton	65.00	/75.00
Soapbark	lb.		
Soapstone	ton	25.00	/35.00

Oil Resistant

AXF	lb.	.40 /	.50

Reenforcers

Carbon Black			
Aerfloted Arrow Specification (bags) f.o.b. plant	lb.	.02425	
Arrow Compact Granulized f.o.b. plant	lb.	.023 /	.02425
(bulk) f.o.b. Hoboken	lb.	.0318	
(bags) f.o.b. No. Atlantic Docks		.0330	
Certified Heavy Compressed f.o.b. plant	lb.	.023 /	.02425
Spheron f.o.b. plant	lb.	.023 /	.02425
Continental Dustless, (f.o.b. works) c.l.	lb.	.023 /	.02425
Compressed, (f.o.b. works) c.l. (bags)	lb.	.02425	
Uncompressed, (f.o.b works), c.l.	lb.	.0255	
Disperso, (f.o.b. works)	lb.	.023 /	.02425
Dixie f.o.b. plant	lb.	.023 /	.02425
(bulk) f.o.b. Hoboken	lb.	.0318	
(bags) f.o.b. No. Atlantic Docks	lb.	.0330	
Dixiedensed f.o.b. plant	lb.	.023 /	.02425
(bulk) f.o.b. Hoboken	lb.	.0318	
(bags) f.o.b. No. Atlantic Docks	lb.	.0330	
Dixiedensed, 66, f.o.b. plant	lb.	.023 /	.02425
(bulk) f.o.b. Hoboken	lb.	.0318	
(bags) f.o.b. No. Atlantic Docks	lb.	.0330	
Excello, c.l., f.o.b., Gulf ports	100 lbs.	$2.75	/$4.75
delivered New York	100 lbs.	3.75 /	5.75
l.c.l., delivered New York	100 lbs.	5.75 /	7.00
Fumonex, c.l., f.o.b. works	lb.	.03	
ex-warehouse	lb.	.05	
Gastex	lb.	.03 /	.07
Kosmobile f.o.b. plant	lb.	.023 /	.02425
(bulk) f.o.b. Hoboken	lb.	.0318	
(bags) f.o.b. No. Atlantic Docks	lb.	.0330	
Kosmobile 66 f.o.b. plant	lb.	.023 /	.02425
(bulk) f.o.b. Hoboken	lb.	.0318	
(bags) f.o.b. No. Atlantic Docks	lb.	.0330	
Kosmos f.o.b. plant	lb.	.023 /	.02425
(bulk) f.o.b. Hoboken	lb.	.0318	
(bags) f.o.b. No. Atlantic Docks	lb.	.0330	
MICRONEX Beads f.o.b. plant	lb.	.023 /	.02425
(bulk) f.o.b. Hoboken	lb.	.0318	
(bags) f.o.b. No. Atlantic Docks	lb.	.0330	
Mark II f.o.b. plant	lb.	.023 /	.02425
(bulk) f.o.b.	lb.	.0318	
(bags) f.o.b. No. Atlantic Docks	lb.	.0330	
Standard f.o.b. plant	lb.	.023 /	.02425
(bulk) f.o.b. Hoboken	lb.	.0318	
(bags) f.o.b. No. Atlantic Docks	lb.	.0330	
W-5 f.o.b. plant	lb.	.023 /	.02425
(bulk) f.o.b. Hoboken	lb.	.0318	
(bags) f.o.b. No. Atlantic Docks	lb.	.0330	
W-6 f.o.b. plant	lb.	.023 /	.02425
(bulk) f.o.b. Hoboken	lb.	.0318	
(bags) f.o.b. No. Atlantic Docks	lb.	.0330	
Paradene No. 2 (drums)	lb.	.04	
Pelletex	lb	.03 /	.07
Supreme, c.l., f.o.b. Gulf ports	100 lbs.	2.75 /	4.75
delivered New York	100 lbs.	3.75 /	5.75
l.c.l., delivered New York	100 lbs.	5.75 /	7.00
"WYEX BLACK" f.o.b. plant	lb.	.023 /	.02425
(bulk) f.o.b. Hoboken	lb.	.0318	
(bags) f.o.b. No. Atlantic Docks	lb.	.0330	

Clays

Aerfloted Paragon (50 lb. bags)	ton	10.00	/22.50
Suprex (50 lb. bags)	ton	10.00	/22.50
Barden	lb.		
Chicora	lb.		
China	ton	17.50	/20.00
Crown, f.o.b. (plant)	ton	10.00	
Dixie	ton	10.00	/24.50
Hi-White, f.o.b. Huber Ga.	ton	11.00	/23.50
Langford	ton	8.50	
McNamee	ton	10.00	/22.50
Par	ton	10.00	/22.50
Witco, f.o.b. works	ton	9.50	
P-33	lb.	.0475/	.0775
Thermax	lb.	.02 /	.0525
Velvetex	lb.	.022 /	.035

Reodorants

Amora A	lb.		
B	lb.		
C	lb.		
D	lb.		
Curodex 19	lb.	2.75	
188	lb.	3.50	
198	lb.	4.50	
Rodo No. 0	lb.	3.50 /	4.00
10	lb.	4.50 /	5.00

Rubber Substitutes

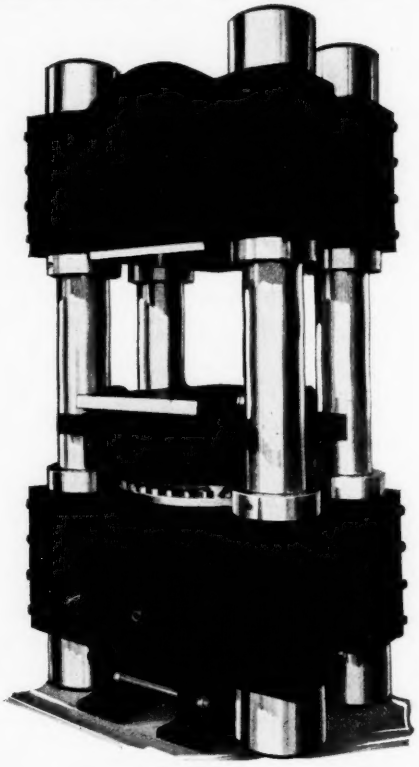
Black	lb.	.08 /	.12
Brown	lb.	.08 /	.11
White	lb.	.085 /	.125
Factice			
Amberex	lb.	.30	
Brown	lb.	.08 /	.11
Fac-Cel B	lb.	.13	
C	lb.	.13	
Neophax A	lb	.095	
B	lb.	.095	
White	lb.	09 /	.13

Softeners

Bondogen	lb.	.98 /	1.50
Burgundy pitch	lb.	.06	
Cycline oil	gal.	.14 /	.20
Nuba resinous pitch (drums)			
Grades No. 1 and No. 2	lb.	.0265	
Nuhalene Resin	lb.	.025	
Palm oil (Witco), cl.	lb.		
Pine tar	gal.		
Plastogen	lb.	.0775/	.12
R-19 Resin (drums)	lb.	.10	
R-21 Resin (drums)	lb.	.10	

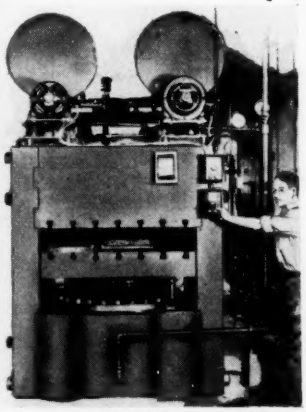
(Continued on page 78)

MODERN PRESSES



for PLASTIC PRODUCTS

ERIE Heavy Duty Hydraulic Presses for standard or special requirements are the product of 36 years' experience designing and building this equipment for the rubber and plastic industry. Above, you see an Erie Hydraulic Press with a 40" ram and 36"x52" platen with 36" opening. It operates at 6,000 lbs. water pressure producing a cross-head load of 3,770 tons and pressure of 4,908 lbs. per square inch on the material. Write for full details on the ability of Erie engineers to cooperate with you.



Above is a 3000 Ton High Pressure Plastic Forming Press. 36" ram 6000 lb. pressure.

ERIE

ERIE FOUNDRY COMPANY • ERIE, PA.

Regular and Special Constructions

of

COTTON FABRICS

Single Filling Double Filling

and

ARMY

Ducks

HOSE and BELTING

Ducks

Drills

Selected

Osnaburgs

Curran & Barry

320 BROADWAY

NEW YORK

COTTON AND FABRICS

NEW YORK COTTON EXCHANGE WEEK-END CLOSING PRICES

Futures	Oct. 28	Nov. 25	Dec. 2	Dec. 9	Dec. 16	Dec. 23
Nov.	9.19	....	....	....	....	....
Dec.	9.29	9.78	10.29	10.77	....	....
Jan.	....	....	10.24	10.74	11.32	11.13
Mar.	9.12	9.61	10.05	10.51	11.13	10.90
July	8.90	9.11	9.48	9.79	10.43	10.24
Sept ...	8.67	8.81	9.20	9.45	10.09	9.89
Oct.	8.45	8.52	8.92	9.11	9.75	9.54

THE cotton market ruled generally strong during December. After closing at 10.36¢ per pound on November 30, the New York 15/16-inch spot middling price advanced sharply during the first half of December under the impetus of active domestic and foreign buying and strong markets abroad, to reach 11.86¢ per pound on December 14. The market then became easier with the price dropping to 11.26¢ per pound on December 20. The closing price on December 29 was 11.56¢ per pound with the market firm during the latter part of the month.

The Census Bureau reported consumption of all cotton exclusive of linters, in domestic mills for November totaled 718,721 bales, against 686,936 bales in October and 596,416 in November, 1938. The November figure represented a new high record for that month and was the highest for any month since early 1937. November exports of cotton totaled 583,644 bales, against 886,332 in October and 480,384 in November, 1938. Cotton imports were 10,679 bales, against 13,678 in October and 14,322 in November, 1938.

On December 8 the government estimated cotton production from this year's crop as of December 1 at 11,792,000 bales, 53,000 bales under its figure of November 1.

The export subsidy for cotton was cut three times during the past month from the original 1.5¢ per pound rate down to 0.2¢. Secretary of Agriculture Wallace warned that further reduction of the subsidy rate or outright discontinuation of it may be necessary, and no advance notice will be given.

Fabrics

There was a sharp demand for fabrics of coarse yarn construction during the first half of December. Sheetings were particularly active, and in one week alone more than one month's production was sold. Considerable interest was shown in wide-loom constructions and in fabrics for rubberizing. Toward the end of the month the market became quieter with the approach of the year-end inventory period. With the Christmas trade business and the fall season over, raincoat manufacture was quiet.

The market strengthened early in the month with the advance of raw cotton, but later lost ground. As compared with last month's quotations, hollands are unchanged, raincoat fabrics are stronger, tire fabrics with the exception of one type are up ½¢ per pound; while other fabric groups show a mixed trend, but are mainly steady.

New York Quotations

December 23, 1939

Drills

38-inch 2.00-yard	yd.	$0.13
40-inch 3.47-yard		.08
50-inch 1.52-yard		.18¾
52-inch 1.85-yard		.15¾
52-inch 1.90-yard		.14¾
52-inch 2.20-yard		.13¾
52-inch 2.50-yard		.12⅝
59-inch 1.85-yard		.15

Ducks

38-inch 2.00-yard D.F.	yd.	.13 /.14
40-inch 1.45-yard S. F.		.18
51¼-inch 1.35-yard D. F.		.20¾
72-inch 1.05-yard D. F.		.28½/.28⅝
72-inch 17.21-ounce		.31½
Mechanicals		
Hose and belting	lb.	.30
Tennis		
52-inch 1.35-yard	yd.	.21½

Hollands

Gold Seal and Eagle		
20-inch No. 72	yd.	.10
30-inch No. 72		.18
40-inch No. 72		.20
Red Seal and Cardinal		
20-inch	yd.	.08¼
30-inch		.15¾
40-inch		.17
50-inch		.26

Osnaburgs

40-inch 2.34-yard	yd.	.11
40-inch 2.48-yard		.10¼
40-inch 2.56-yard		.09¼
40-inch 3.00-yard		.08⅝
40-inch 7-ounce part waste		.09⅛
40-inch 10-ounce part waste		.13
37-inch 2.42-yard		.10¾

Raincoat Fabrics

Cotton		
Bombazine 60 x 64	yd.	.08¾
Plaids 60 x 48		.11
Surface prints 60 x 64		.12¾
Print cloth, 38½-inch, 60 x 64		.05½
Sheetings, 40-Inch		
48 x 48, 2.50-yard	yd.	.09¼
64 x 68, 3.15-yard		.08¾
56 x 60, 3.60-yard		.07¼
44 x 40, 4.25-yard		.06¼
Sheetings, 36-Inch		
48 x 48, 5.00-yard	yd.	.05¼
44 x 40, 6.15-yard		.04¼

Tire Fabrics

Builder		
17¼ ounce 60" 23/11 ply Karded peeler	lb.	.29½
Chafer		
14 ounce 60" 20/8 ply Karded peeler	lb.	.29
9¼ ounce 60" 10/2 ply Karded peeler	lb.	.28½
Cord Fabrics		
23/5/3 Karded peeler, 1 1/16" cotton	lb.	.30
15/3/3 Karded peeler, 1 1/16" cotton	lb.	.28
12/4/2 Karded peeler, 1 1/16" cotton	lb.	.27
23/5/3 Karded peeler, 1¼" cotton	lb.	.35½
23/5/3 Combed Egyptian	lb.	.49
Leno Breaker		
8¼ ounce and 10¼ ounce 60" Karded peeler	lb.	.31½

New York Quotations

(Continued from page 76)

Softeners (Cont'd)

Reogen	lb.	$0.115 /$0.26
Rosin oil, compounded	gal.	.40
RPA No. 1	lb.	.65
2	lb.	.65
3	lb.	.46
Rubtack	lb.	.10
Tackol	lb.	.085 / .18
Tonox	lb.	.52 / .61
Tonox D	lb.	.75 / .85
Witco No. 20	gal.	.20
X-1 Resinous oil (tank car)	lb.	.019

Solvents

Beta-Trichlorethane	gal.	
Carbon bisulphide	lb.	
tetrachloride	lb.	
Industrial 90% benzol (tank car)	gal.	$0.16
Skellysolve	gal.	

Stabilizers for Cure

Laurex, ton lots	lb.	.1125/$0.1375
Stearex B.	lb.	
Beads	lb.	
Stearic acid, single pressed	lb.	.10 / .11
Stearite	100 lbs.	10.50
Zinc stearate	lb.	.225 / .245

Synthetic Rubber

Neoprene Type E	lb.	.65
G	lb.	.70
GW	lb.	.75
H	lb.	.78
M	lb.	.65
Latex Type 57	lb.	.30

Varnish

Shoe	gal.	1.45

Vulcanizing Ingredients

Sulphur		
Chloride, drums	lb.	.035 / .04
Rubber	100 lbs.	2.00
Telloy	lb.	1.75
Vandex	lb.	1.75

(See also Colors—Antimony)

Waxes

Carnauba, No. 3 chalky	lb.	
2 N.C.	lb.	
3 N.C.	lb.	
1 Yellow	lb.	
2	lb.	
Montan, crude	lb.	

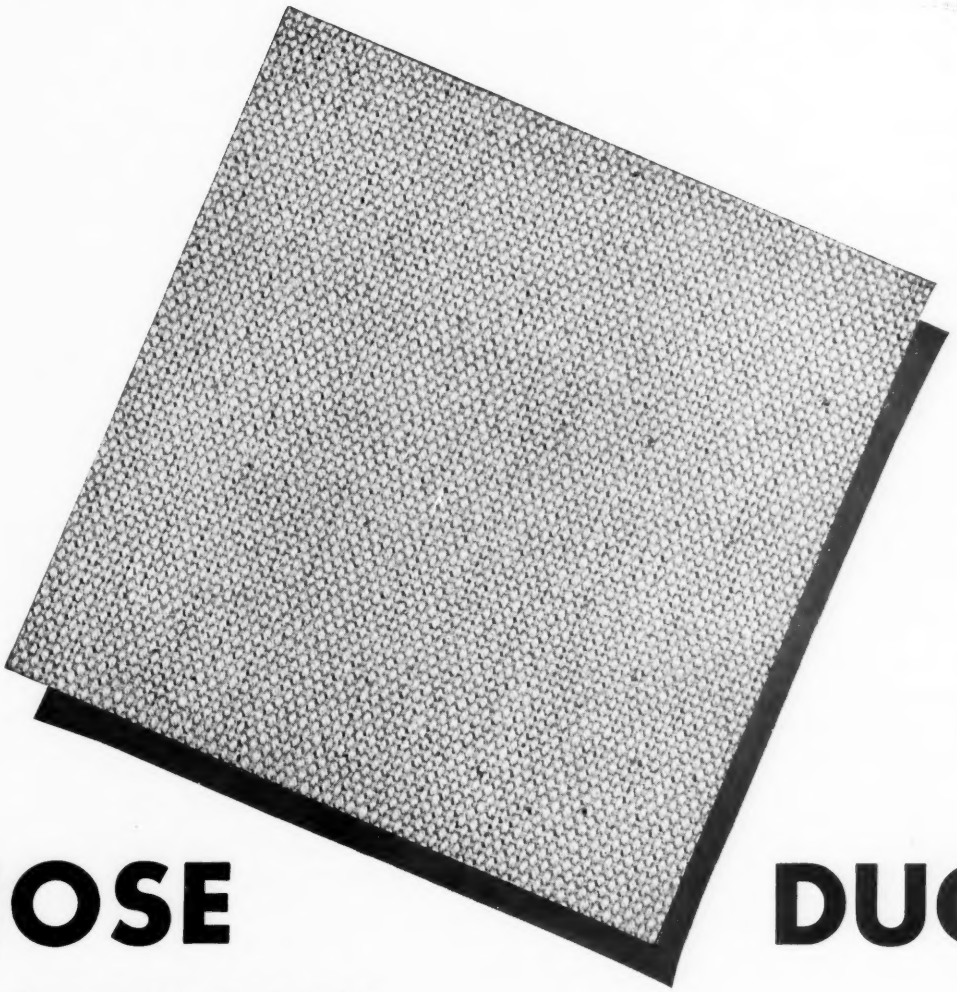
Tire Production Statistics

	Pneumatic Casings		
	Inventory	Production	Shipments
1937	10,383,235	53,309,973	53,485,388
1938	8,451,390	40,182,392	42,330,072
1939			
Jan.	8,932,245	4,581,380	4,163,005
Feb.	9,572,553	4,343,513	3,738,696
Mar.	10,108,584	5,137,030	4,582,655
Apr.	9,997,527	4,211,152	4,355,584
May	9,918,759	4,418,072	4,753,403
June	8,909,495	4,869,862	5,750,149
July	8,300,126	4,510,122	5,055,637
Aug.	8,890,793	5,491,664	4,919,140
Sept.	8,364,147	5,007,219	5,621,088
Oct.	8,656,821	5,430,679	5,187,942
Nov.	9,243,792	4,866,753	4,243,791

	Pneumatic Casings		
	Original Equipment	Replacement Sales	Export Sales
1937	22,352,601	29,886,326	1,246,461
1938	10,716,130	30,565,008	1,048,934
1939			
Jan.	1,685,190	2,353,822	123,993
Feb.	1,472,356	2,159,901	106,439
Mar.	1,746,999	2,719,450	116,206
Apr.	1,528,637	2,736,155	90,792
May	1,414,798	3,240,936	97,669
June	1,370,317	4,264,298	98,739
July	808,611	4,160,319	86,707
Aug.	610,771	4,198,410	109,959
Sept.	1,248,773	4,203,887	112,069
Oct.	1,804,648	3,238,829	144,465
Nov.	1,822,978	2,296,164	124,649

	Inner Tubes		
	Inventory	Production	Shipments
1937	10,311,745	52,373,330	52,766,728
1938	8,165,696	37,847,656	40,292,614
1939			
Jan.	8,068,700	4,097,759	3,935,652
Feb.	8,414,652	3,680,521	3,334,791
Mar.	8,900,944	4,470,184	4,015,333
Apr.	8,837,313	3,841,308	3,927,033
May	8,839,536	3,847,827	4,154,390
June	8,043,999	4,319,943	5,123,108
July	7,818,822	4,043,028	4,285,435
Aug.	8,238,406	4,918,165	4,432,396
Sept.	7,845,764	4,512,460	5,024,992
Oct.	7,716,531	5,072,648	5,011,880
Nov.	8,214,097	4,513,118	3,939,593

Source: The Rubber Manufacturers Association, Inc. Figures adjusted to represent 100% of the industry.



HOSE DUCK

Shawmut Hose Duck is but one of the many fabrics we supply to the rubber industry. And Shawmut Hose Duck's reputation for reliability is just another example of the high standing of our fabrics among rubber engineers. We will be glad to discuss rubber fabrics with you at your convenience.

WELLINGTON SEARS COMPANY

65 Worth St., New York, N. Y.

Foreign Trade Information

For further information concerning the inquiries listed below address United States Department of Commerce, Bureau of Foreign and Domestic Commerce, Room 734, Custom House, New York, N. Y.

No.	Commodity	City and Country
*4793	Cables and wire	Buenos Aires, Argentina
†4817	Rubber-insulated copper wire	Johannesburg, South Africa
†4818	Batteries	London, England
*4819	Automobile accessories	Buenos Aires, Argentina
‡4825	Batteries and hair and balata belting.	Singapore, Straits Settlements
*4846	Garters and suspenders	Lima, Peru
*4855	Battery box machinery	Lima, Peru
†4858	Rubber goods machinery	Cairo, Egypt
*4870	Truck and bus tires	Lima, Peru
*4887	Druggists' and surgical goods	Cairo, Egypt
*4894	Garters, girdles, and suspenders	Lima, Peru
*4896	Garters	Lima, Peru
*4897	Suspenders	Lima, Peru
†4905	Surgical goods	Johannesburg, South Africa
*4915	Wires and cables	Melbourne, Australia
*4916	Insulating materials	Habana, Cuba
*4925	Belting, mats, toys, balloons, hot water bottles, hose, and hospital and surgical goods	Amsterdam, Netherlands
†4933	Sheet rubber	Stockholm, Sweden
*4934	Druggists' sundries	Rio de Janeiro, Brazil
¶4938	Druggists' sundries	Stockholm, Sweden
†4939	Sporting goods and toys	Stockholm, Sweden
¶4953	Druggists' sundries	Colombes, France
*4973	Gloves	Lima, Peru
¶4978	Transmission belts, hose, and rubber thread	Mexico City, Mexico
*4979	Wires and cables	Athens, Greece
*4981	Air cushions, bathing novelties, and hot water bags	Sydney, Australia
*4987	Wires and cables	Oporto, Portugal
¶4989	Garters and raincoats	Batavia, Java
‡4999	Batteries	Cairo, Egypt
†5052	Hose	Oslo, Norway
†5053	Druggists' sundries	Istanbul, Turkey
¶5055	Sporting goods	Zurich, Switzerland
*5059	Golf balls	Durban, South Africa
*5097	Surgical and hospital goods	Cairo, Egypt
†5102	Cables	Aalborg, Denmark
*5108	Druggists' sundries	Lisbon, Portugal
*5147	Hospital sheeting	Cairo, Egypt
†5151	Friction tape	Calcutta, India
*5160	Household and industrial rubber products	Montevideo, Uruguay
*5169	Soles, heels, and rubberized fabrics	Manila, Philippine Islands
*5182	Cables and wires	Athens, Greece
*5184	Cables	Lahore, India
‡5189	Elastics	Melbourne, Australia
‡5198	Hose, rubber sheets, packings, and synthetic rubber	Arnheim, Netherlands
*5200	Bathing caps, gloves, druggists' sundries, and dipped goods	Cairo, Egypt
*5202	Thread	Sao Paulo, Brazil
†5253	Cables	Madrid, Spain
†5257	Factice	Pfaeffikon, Switzerland
‡5261	Cables	Melbourne, Australia
*5265	Insulated copper wire	Beirut, Syria
†5266	Cables and wires	Bombay, India
‡5270	Wire and cord cables	Lima, Peru
¶5272	Cables	Stockholm, Sweden
†5296	Elastic for corsets	Istanbul, Turkey
†5316	Rubber pants	Buenos Aires, Argentina
‡5318	Druggists' sundries and hospital supplies	Melbourne, Australia
*5325	Druggists' sundries	Medellin, Colombia

*Agency †Purchase. ‡Purchase and agency. ¶Purchase or agency. §Exclusive agency.

Rubber Trade Inquiries

The inquiries that follow have already been answered; nevertheless they are of interest not only in showing the needs of the trade, but because of the possibility that additional information may be furnished by those who read them. The Editor is therefore glad to have those interested communicate with him.

No.	Inquiry
2701	Manufacturers of rubber massage parts for bath sprays.
2702	Manufacturers of tires.
2703	Manufacturers of equipment for making tires and tubes.
2704	Manufacturers of ball or pebble mills.
2705	Suppliers of first latex crepe.
2706	Suppliers of sole crepe rubber.
2707	Suppliers of liquid latex.
2708	Manufacturers of rubber thread.
2709	Manufacturer of Daisy transparent nipples.
2710	Supplier of spreader heads.
2711	Manufacturer of rubber padding for the bottom of pails to make them noiseproof.
2712	Manufacturers of synthetic rubber hose for gasoline and oil.
2713	Manufacturers of ⅝-inch rubber balls.
2714	Suppliers of dispersed rubber.
2715	Suppliers of reclaimed rubber.
2716	Suppliers of latex.
2717	Suppliers of crude and washed gutta percha.
2718	Manufacturers of latex upholstering material.
2719	Manufacturers of machines for making dipped goods.
2720	Manufacturers of sponge rubber.
2721	Manufacturers of ink for printing on rubber goods.
2722	Manufacturers of machines for making rubber bladders and cycle tubes.
2723	Manufacturers of contraceptives.

World Net Imports of Crude Rubber—Long Tons

Year	U.S.A.	U.K.†	Argentine	Australia	Belgium	Canada	France	Greater Germany‡	Italy	Japan	Poland	Sweden	U.S.S.R.	Rest of the World	Total
1937...	592,500	135,900	9,500	19,300	15,000	36,100	60,000	115,000	24,000	62,200	6,100	6,700	30,400	52,600	1,120,400
1938...	406,330	168,172	7,653	12,309	11,310	25,696	58,148	107,917	28,170	46,307	7,849	8,304	25,676*	49,174	926,895
1939															
Jan. ..	36,614	7,121	417	954	898	2,867	4,694	9,095	2,133	2,553	665	643	4,000*	4,282	70,651
Feb. ..	30,578	8,087	1,092	1,785	1,068	1,451	5,327	8,348	2,025	3,263	709	467	1,000*	4,824	66,710
Mar. ..	45,286	12,092	440	1,324	1,242	2,458	4,503	9,028	1,525	4,019	985	581	2,000*	4,901	86,374
Apr. ..	31,590	7,129	786	1,138	855	1,559	5,650	9,316	1,926	3,579	673	994	2,000*	4,614	69,432
May ..	45,390	10,488	353	1,202	792	3,069	4,646	9,031	1,573	4,438	940	1,047	1,000*	5,818	86,830
June ..	33,950	10,287	965	1,348	621	2,465	4,649	8,677	1,992	3,067	693	2,252	500*	4,701	74,196
July ..	36,932	6,205	983	1,472	836	3,214	4,282	8,847	1,408	3,668	750*	644	1,000*	4,160	72,139
Aug. ..	38,319	9,391	619	2,182	952	2,187	....	....	....	3,146	....	1,057	2,500*	4,816	76,501
Sept..	36,197	....	600*	875	1,079	2,542	....	....	....	3,000*	....	280	....	3,960	....

*Estimated. †U. K. figures show gross imports, not net imports. ‡Including imports of Austria and Czechoslovakia. Source: *Statistical Bulletin of the International Rubber Regulation Committee.*

Shipments of Crude Rubber from Producing Countries—Long Tons

Year	Malaya including Brunei and Labuan	N.E.I.	Ceylon	India	Burma	North Borneo	Sarawak	Thailand	French Indo-China	Total	Philippines and Oceania	Liberia†	Other Africa	South America	Mexican Guayule	Grand Total
1937.....	469,900	431,700	70,400	9,800	7,200	13,200	25,900	35,600	43,400	1,107,100	1,600*	2,300	9,100	16,300	3,400	1,139,800
1938.....	372,046	298,101	49,528	8,455	6,737	9,512	17,792	41,618	59,156	862,945	1,971*	2,929	9,000*	15,337	2,758	894,940
1939																
Jan.	24,393	38,678	7,237	764	1,115	1,604	2,342	2,918	4,739	83,790	220	528	800	1,812	347	87,497
Feb.	29,278	24,996	5,495	947	618	664	1,484	5,606	5,659	74,747	158	435	800	1,187	319	77,646
Mar.	29,298	27,934	3,718	774	619	344	1,177	5,401	4,636	73,901	230*	427	800	1,407	210	76,975
Apr.	29,779	28,341	2,225	881	379	1,687	2,446	2,660	2,581	70,979	135	533	800	1,206	167	73,820
May	29,598	24,429	2,805	1,002	668	558	1,649	2,782	4,585	68,076	129	500*	800	1,077	231	70,813
June	22,052	27,511	3,708	630	805	332	1,157	1,748	4,030	61,973	137	667	800	676	166	64,419
July	26,013	35,681	5,019	782	503	1,603	3,092	5,599	3,367	81,659	190	516	800	1,071	150†	84,386
Aug.	40,973	27,297	5,620	203	213	975	1,749	5,230	7,020	89,280	200*	222	800	1,313	178†	91,993
Sept.	26,908	37,717	6,211	691	89	429	1,932	4,670	5,943	84,590	200*	599	800	1,356	200*	87,745
Oct.	49,458	44,786	5,235	672	150	1,730	2,487	2,047	5,022	111,587	150*	500*	800	1,524	200*	114,761

*Estimated. †Guayule rubber imports into U.S.A. and Germany provisional until export figures from Mexico are received. Source: *Statistical Bulletin of the International Rubber Regulation Committee.*

CLASSIFIED ADVERTISEMENTS

ALL CLASSIFIED ADVERTISING MUST BE PAID IN ADVANCE

GENERAL RATES	SITUATIONS WANTED RATES	SITUATIONS OPEN RATES
Light face type $1.00 per line (ten words)	Light face type 40c per line (ten words)	Light face type 75c per line (ten words)
Bold face type $1.25 per line (eight words)	Bold face type 55c per line (eight words)	Bold face type $1.00 per line (eight words)

Allow nine words for keyed address. *Replies forwarded without charge.*

SITUATIONS WANTED

ONE HUNDRED DOLLARS REWARD

to anyone getting me interview leading to employment as time study man. Details of long, thorough time study experience in rubber industry on request. Reward paid immediately on acceptance of position. Address Box No. 56. care of INDIA RUBBER WORLD.

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(*Advertisements continued on page* 83)

United States Statistics

Imports for Consumption of Crude and Manufactured Rubber

	October, 1939		Ten Months Ended October, 1939	
	Quantity	Value	Quantity	Value
UNMANUFACTURED—*Free*				
Liquid latex (solids)....*lb.*	5,724,048	$968,207	48,366,298	$8,111,840
Jelutong or pontianak....*lb.*	1,042,777	127,084	13,139,148	1,402,512
Balata ....*lb.*	239,199	43,267	1,196,786	188,914
Gutta percha ....*lb.*	334,840	48,655	2,780,256	418,697
Guayule ....*lb.*	631,400	61,376	3,993,600	365,266
Scrap and reclaimed....*lb.*	719,130	17,696	8,815,003	155,875
Totals	8,691,394	$1,266,285	78,291,091	$10,643,104
Misc. rubber (above), 1,000 *lbs.*	8,691	$1,266,285	78,291	$10,643,104
Crude rubber....1,000 *lbs.*	95,837	15,211,621	810,873	127,141,741
Totals ....1,000 *lbs.*	104,528	$16,477,906	889,164	$137,784,845
Chicle, crude ....*lb.*	335,100	$122,110	11,562,631	$4,044,119
MANUFACTURED—*Dutiable*				
Rubber tires ....*no.*	445	$536	24,242	$88,280
Rubber boots, shoes and overshoes ....*prs.*	1,358	236	14,372	3,788
Rubber soled footwear with fabric uppers ....*prs.*	80,342	10,543	692,434	124,404
Golf balls ....*no.*	129,024	9,372	592,497	57,175
Lawn tennis balls....*no.*	14,016	2,356	1,067,339	116,092
Other rubber balls....*no.*	94,930	3,304	2,596,775	86,856
Other rubber toys....*lb.*	31,141	4,573	231,801	36,798
Hard rubber combs....*no.*	.....	.....	555,345	41,705
Other manufactures of hard rubber	.....	1,526	.....	22,732
Friction or insulating tape.*lb.*	2,089	1,629	123,648	26,913
Belts, hose, packing, and insulating material	.....	3,124	.....	58,058
Druggists' sundries of soft rubber	.....	1,071	.....	45,917
Inflatable swimming belts, floats, etc. ....*no.*	10,576	642	559,447	35,655
Other rubber and gutta percha manufactures	.....	9,504	.....	401,574
Totals	.....	$48,416	.....	$1,145,947

Exports of Foreign Merchandise

RUBBER AND MANUFACTURES				
Crude rubber ....*lb.*	13,184,662	$2,881,172	24,150,675	$4,763,096
Balata ....*lb.*	38,970	8,233	151,436	34,808
Other rubber, rubber substitutes and scrap....*lb.*	.....	.....	207,967	11,792
Rubber manufactures (including toys)	.....	1,243	.....	20,326
Totals	.....	$2,890,648	.....	$4,830,022

Exports of Domestic Merchandise

RUBBER AND MANUFACTURES				
Reclaimed ....*lb.*	4,068,632	$194,082	21,524,360	$1,094,813
Scrap ....*lb.*	6,428,651	103,136	85,905,370	1,348,523
Cements ....*gal*	77,929	100,253	482,325	620,030
Rubberized auto cloth.*sq. yd.*	21,909	9,329	158,215	79,042
Other rubberized piece goods and hospital sheeting..*sq. yd.*	291,175	98,147	2,394,917	876,168
Boots ....*prs.*	8,110	16,734	74,821	164,029
Shoes ....*prs.*	15,818	9,756	157,787	93,345
Canvas shoes with rubber soles ....*prs*	88,233	58,891	519,325	349,226
Soles ....*doz. prs.*	4,923	10,937	37,084	79,933
Heels ....*doz. prs.*	44,759	26,920	372,139	208,223
Soling and top lift sheets.*lb.*	183,409	30,842	663,571	125,036
Gloves and mittens..*doz. prs.*	13,835	27,192	97,847	206,056
Water bottles and fountain syringes ....*no.*	26,467	9,504	232,639	81,243
Other druggists' sundries...	.....	103,131	.....	643,324
Gum rubber clothing....*doz.*	19,793	39,430	236,570	537,590
Balloons ....*gross*	47,981	37,584	349,140	273,078
Toys and balls....	.....	33,525	.....	159,613
Bathing caps ....*doz.*	3,908	7,174	47,146	92,263
Bands ....*lb.*	10,816	4,467	203,505	82,504
Erasers ....*lb.*	43,259	26,264	256,824	142,691
Hard rubber goods				
Electrical battery boxes.*no.*	22,834	16,898	173,583	124,202
Other electrical ....*lb.*	38,495	8,305	238,484	65,056
Combs, finished....*doz.*	32,264	19,000	158,242	92,272
Other hard rubber goods...	.....	16,606	.....	137,046
Tires				
Truck and bus casings.*no.*	52,008	1,009,476	286,463	5,520,249
Other auto casings....*no.*	66,238	678,634	643,150	6,731,515
Tubes, auto ....*no.*	89,785	147,410	648,282	1,034,637
Other casings and tubes..*no.*	10,463	78,194	105,802	813,959
Solid tires for automobiles and motor trucks....*no.*	1,047	22,911	3,512	58,119
Other solid tires....*lb.*	14,399	3,432	155,335	35,382
Tire sundries and repair materials ....*lb.*	329,403	88,388	2,423,041	676,732
Rubber and friction tape..*lb.*	77,888	21,661	556,716	161,153
Fan belts for automobiles.*lb.*	54,668	30,369	543,225	313,215
Other rubber and balata belts ....*lb.*	268,144	148,956	2,486,024	1,376,939
Garden hose ....*lb.*	75,876	14,634	822,313	170,617
Other hose and tubing....*lb.*	1,397,327	522,139	7,426,643	2,873,831
Packing ....*lb.*	165,007	69,013	1,107,390	488,663
Mats, matting, flooring, and tiling ....*lb*	107,458	12,810	1,079,082	161,398
Thread ....*lb.*	48,977	34,834	541,102	466,838
Gutta percha manufactures *lb.*	117,255	33,975	1,264,438	367,377
Other rubber manufactures..	.....	230,684	.....	1,426,506
Totals	.....	$4,155,627	.....	$30,352,436

Rubber Questionnaire—Third Quarter, 1939*

	Long Tons			
	Inventory at End of Quarter	Production	Shipments	Consumption
RECLAIMED RUBBER				
Reclaimers solely (5).....	5,307	19,026	20,082	.....
Manufacturers who also reclaim (15)..	5,616	13,736	2,164	13,061
Other manufacturers (106).....	5,175	.....	.....	14,640
Totals	16,098	32,762	22,246	28,601

	Long Tons		
SCRAP RUBBER	Inventory	Consumption	Due on Contracts
Reclaimers solely (5).....	38,505	22,167	10,204
Manufacturers who also reclaim (14)..	31,267	16,154	6,592
Other manufacturers (12).....	352	.....	.....
Totals	70,124	38,321	16,796

Tons of Rubber Consumed in Rubber Products and Total Sales Value of Shipments

PRODUCTS	Rubber Consumed Long Tons	Total Sales Value of Shipments of Manufactured Rubber Products
Tire and Tire Sundries		
All types pneumatic casings (except bicycle, airplane)	70,591	$91,982,000
All types pneumatic tubes (except bicycle, airplane)	10,487	11,138,000
Bicycle tires, including juvenile pneumatics (single tubes, casings, and tubes).....	822	1,763,000
Airplane tires and tubes.....	85	250,000
Solid and cushion tires for highway transportation.	59	102,000
All other solid and cushion tires.....	86	281,000
Tire sundries and repair materials.....	2,996	3,774,000
Totals	85,126	$109,290,000
OTHER RUBBER PRODUCTS		
Mechanical rubber goods	9,938	$28,888,000
Boots and shoes	3,785	14,654,000
Insulated wire and cable compounds.....	1,343	†
Druggists' sundries, medical and surgical rubber goods	885	3,281,000
Stationers' rubber goods.....	540	739,000
Bathing apparel	83	189,000
Miscellaneous rubber sundries.....	856	1,863,000
Rubber clothing	156	796,000
Automobile fabrics	77	346,000
Other rubberized fabrics.....	1,107	3,211,000
Hard rubber goods.....	458	2,093,000
Heels and soles.....	3,195	5,468,000
Rubber flooring	333	514,000
Sponge rubber	1,332	1,429,000
Sporting goods, toys, and novelties.....	472	1,457,000
Totals	24,560	$64,928,000
Grand totals—all products.....	109,686	$174,218,000

Inventory of Rubber in the United States and Afloat

	Long Tons	
	Crude Rubber on Hand	Crude Rubber Afloat
Manufacturers	65,081	10,285
Importers and dealers	27,422	55,343
Totals	92,503	65,628

*Number of rubber manufacturers that reported data was 186; crude rubber importers and dealers, 46; reclaimers (solely), 5; total daily average number of employes (reporting manufacturers and reclaimers), 132,497.

It is estimated that the reported grand total crude rubber consumption is 75.9%; grand total sales value, 75%; the grand total crude rubber inventory, 61.9%; afloat figures, unavailable; the reclaimed rubber production, 68.0%; reclaimed consumption, 60.4%; and reclaimed inventory, 76.0% of the total of the entire industry.

† Owing to the difficulty of securing representative sales figures this item has been discontinued.

Compiled from R.M.A. statistics.

Imports by Customs Districts

	October, 1939 *Crude Rubber		October, 1938 *Crude Rubber	
	Quantity	Value	Quantity	Value
Massachusetts	11,794,258	$1,963,302	10,299,408	$1,637,071
St. Lawrence	2,234	341	.....	.....
New York	76,042,272	12,039,764	53,841,055	8,072,166
Philadelphia	935,638	143,820	1,212,772	162,586
Maryland	1,573,332	242,440	1,188,360	158,055
Virginia	.....	.....	268,800	33,584
Georgia	.....	.....	1,955,394	246,656
Mobile	1,419,540	208,041	83,168	9,618
New Orleans	3,505,406	554,252	3,326,266	368,842
Galveston	45,100	6,687	.....	.....
Los Angeles	6,415,359	1,009,315	4,285,994	534,301
San Francisco	458,936	73,242	691,141	95,413
Oregon	.....	.....	16,800	2,654
Totals	102,192,075	$16,241,204	77,169,158	$11,320,936

*Crude rubber including latex dry rubber content.